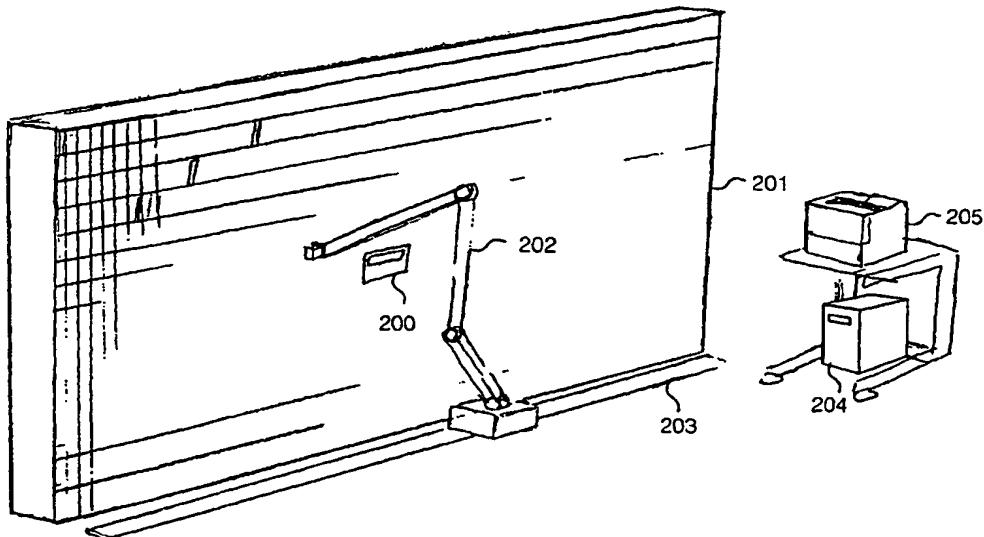




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(71) Applicant (<i>for all designated States except US</i>): HEWLETT-PACKARD COMPANY [US/US]; 3000 Hanover Street, Palo Alto, CA 94304 (US).		
(72) Inventors; and (75) Inventors/Applicants (<i>for US only</i>): GOLD, Stephen [GB/GB]; Rock Cottage, Stoke Lane, Winterbourne Down, Bristol BS36 1DJ (GB). CRIGHTON, Ian, Peter [GB/GB]; 1 Old Manor Cottages, Winterbourne Hill, Winterbourne, Bristol BS36 1JS (GB).		
(74) Agent: LAWMAN, Matthew, John, Mitchell; Hewlett-Packard Limited, Intellectual Property Section, Filton Road, Stoke Gifford, Bristol BS34 8QZ (GB).		

(54) Title: INTELLIGENT MEDIA READER AND LABEL PRINTER



(57) Abstract

A library system having a reader and labeling device (200) for interrogating data storage cartridges of the type containing an in-built memory chip having information stored describing details of data contained on the data storage medium is disclosed. The reader-labeling device comprises a processor, random access memory, printer, display, keypad, operating system, transponder, receiver and battery power supply. Key parameters describing a data cartridge can be accessed quickly and efficiently without the need to access the data storage medium itself. A cartridge media specific label may be rapidly printed for attachment to a data storage cartridge. The reader-labeling device may be incorporated into an automatic library (201) accessible by a robotic arm (202), wherein the user may quickly read summary information describing a data storage cartridge or its contents from information stored on a memory attached to the cartridge by use of the reader-labeling device externally controlled.

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INTELLIGENT MEDIA READER AND LABEL PRINTER

Field of the Invention

The present invention relates to recording medium cartridges of the type
5 which include a memory device for storing information concerning the cartridge
and data recorded on the recorded medium, and particularly although not
exclusively it relates to the manner of reading this information and using it to
produce a printed label containing all of, or a selected subset of this information.

10 Background to the Invention

In order to store digital electronic data, such as back-up data from a server computer device, it is known to use magnetic tape data storage cartridges comprising one or a pair of rotatable reels, and an elongate band of magnetic tape. A main reason for using such tape data storage cartridges is to make back up copies of important data. Customers running large computer installations, or research and development facilities having significant amounts of data generated may have hundreds or thousands of tape data storage cartridges containing back up data, backed up from a wide range of different host devices such as servers and computer devices. Large collections of tape data storage cartridges tend to be stored in centralised library locations, sometimes situated in fire proof safes or fire proof rooms. The library storage facility may be geographically remote from the host server devices, so that if there is destruction of data on the host devices, for example by a fire, the back up data remains safe. When a host device fails and data is lost, it is necessary to quickly locate the tape cartridge having the latest back up data, which may be located in an offsite library.

These libraries include manual access libraries, where the cartridges are simply stored on shelves or in racks or boxes, with access to the cartridges being by manually picking up the cartridges, or automated libraries, where the

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cartridges are stored in predefined locations on a rack or shelf and are automatically accessed. In a manual access library, to identify a content of a tape cartridge a person may simply write out a label manually, describing the content of the data on the tape cartridge. This process is tedious and prone to error. For example the wrong label might be put on the wrong tape, so that the contents of the label do not coincide with the data of the tape cartridge. Alternatively, tape cartridges have barcodes printed on their external cases, so conventionally finding a particular tape may involve using a barcode scanner to scan a plurality of barcode labels on a plurality of tape cartridges. In the case of an automated library, robotic arms which are software controlled, deposit and collect cartridges in a rack, or shelf, and use a serial number of a tape data storage cartridge to determine a location within the library shelf or rack on which to store the cartridge. The rack or shelf is accessible by the robotic arm which may physically select a required tape on receipt of user instructions, the robotic arm being moved under computer control to a cartridge storage location on the rack or shelf.

Conventionally, a person wishing to find an item of stored data on a cartridge will need firstly to identify the correct cartridge with the data on it, and secondly identify a position of the data on the tape stored within the cartridge. In the case of single reel cartridges, the whole of the magnetic tape is wound on to the single cartridge whenever the cartridge is not in a tape drive mechanism. To find a particular item of data on a cartridge, a person must select the cartridge, put the cartridge into a conventional tape drive device, for example forming part of a host personal computer, workstation, or computerised test equipment device, and view a content of the tape on a visual display unit forming part of the host computer, workstation or test equipment device. There is a time lag incurred in winding and rewinding the tape to identify a particular item of data.

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A current industry trend in tape data storage media is to supply a solid state transponder memory data storage device on or within a tape cartridge, on which can be stored information describing a data content of the tape. Examples of the type of information stored include file name and type, customer information, 5 system data backed-up, application and file space on the magnetic tape used or remaining. The information stored on such a memory device is upgraded when the magnetic tape is accessed using a known tape drive in a host computer having an integrated driver and read-write device, controlled by software resident on the host device. Many different types of tape data storage cartridge are used 10 in system backup and the location of the transponder memory storage device in relation to a casing of the tape cartridge varies between cartridge media types and is specific to the particular cartridge media type in each case.

To identify items of data stored on the tape cartridge, the memory device 15 comprising part of the cartridge stores data as mentioned above, describing the file names, customer information, application and file space remaining on the tape or used on the tape, and dates of storage of files. A summary information describing the data items stored on the tape can be obtained by automatically interrogating the transponder memory storage device in the cartridge, which is 20 read by the tape drive device by inductive coupling to a transceiver chip forming part of the memory device, and which can be displayed on the visual display unit of the host device. Reading the content of the memory device involves physically picking up the data cartridge, putting the data cartridge in the tape drive of the host device, operating a keypad or pointing device, for example a mouse or 25 tracker ball, to select menu items from an application program on the host device, in order to identify the information describing the data content of the tape.

In order to print a label for the tape, this involves running an application 30 stored on the host device, perhaps manually entering the information describing the data on the tape via a keyboard and/or pointing device and then printing out

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the label. A problem in printing a label for the tape cartridge by this mechanism is the time taken to print each label. For example, for a person wishing to find a particular item of data in a library, the first time a person enters the library on a particular day, he may have to pick an unlabeled tape cartridge which the person
5 thinks the data item may reside on, and in order to check the data on the cartridge needs to turn on the host computer device, wait for the host device to boot up and initialise, taking possibly a minute or two, select the application required for reading the memory device on the cartridge, again perhaps taking of the order of one or two minutes, and then read the data. If the data cartridge
10 does not contain the required data, then the person needs to remove the cartridge from the drive, which may or may not involve a delay in the software controlling the tape drive unit allowing the person to remove the tape, and then select a different tape from the shelf. For the second, subsequent tape cartridge inspected, the time delays will be shorter than inspecting the first data cartridge,
15 since the host device does not need to be booted up and initialised. However, there is still a significant delay in interrogating the memory device on the cartridge through the application software provided by the host device.

Having found the data cartridge containing the required data, in order to
20 print a label for attachment to the cartridge, the person needs to call up the application software for printing the label, perhaps enter details describing the cartridge manually into the printing application software, using a keyboard and/or pointing device and before printing make sure that an attached printer device is turned on. In order to turn the printing device on, the printing device may go
25 through a print initialisation routine, which in the case of an inkjet printer may take several minutes if used for the first time on a particular day, and providing there is sufficient print medium in the printer device, then a label can be printed. However, since many printer devices use paper as a print medium, it may be necessary to find and insert sheets of adhesive labels into the printer in order to
30 print out an adhesive label for the tape cartridge.

Therefore, conventionally it may take anything of the order of 10 to 15 minutes to print a label for a data cartridge, including all the time delays involved in booting up a host device and initialising a printer. Additionally, this assumes
5 that a host computer device is available at the location of the library, which it may not be, in which case an additional delay is incurred in taking the tapes to the host device for the data to be reloaded. Although the time delay taken to print a label for subsequent tape cartridges after the first will reduce per cartridge, the cataloguing and identification of data stored on existing legacy libraries of tape
10 data storage cartridges is a time consuming process, whether the library is a manual access library, or an automated library having a robotic device for selected cartridges.

In all cases, in order to improve ease and accuracy of access to the
15 required data, a system for checking the data stored on a tape and labeling the tape accurately will be of benefit.

Summary of the Invention

Specific embodiments and methods according to the present invention aim
20 to improve the speed and accuracy of access of data contained on a plurality of data storage cartridges in a library of such cartridges.

The specific embodiments and methods disclosed herein aim to provide improved protection against loss of data by providing a rapid and accurate means
25 of locating backed-up data required to restore lost data to a system.

Specific methods according to the present invention, recognise that information contained on transponder memory devices in a data storage cartridge can be used to provide a rapid means of access to a data set which can be
30 utilised to identify the cartridge and to produce a cartridge label.

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Conceptually, the specific embodiments of the invention aim to provide an integrated printer with built-in radio frequency capability to read information stored on a memory device integrated into a data storage medium cartridge casing which automatically prints the information read from the memory device in a pre-formatted user-readable form on a label suited to the specific cartridge casing type.

According to first aspect of the present invention there is provided an automatic library device for storing a plurality of cartridge type data storage devices each having a casing containing a high capacity data storage medium, and having a programmable memory device attached to said casing, said programmable memory device storing data describing said data storage device, said library device comprising:

a rack storage means having a plurality of receptacles for storing said plurality of said data storage devices;

an automatic selection means operable to select, retrieve and replace said data storage devices from said rack; and

a reader device capable of reading a data content stored on a said programmable data storage device, wherein said selection means is configured to present a said data storage medium to said reader device, said reader device being configured to read data signals from said data storage device and print said data onto a print media.

Preferably said reader device comprises a port configured to accept said cartridge type data storage device, and a printer device located in said port, said printer configured to print directly to a said data storage device when said data storage device is inserted in said port.

Said reader device may comprise:

5 a receiver means capable of receiving data signals from a said
programmable memory of a said data storage device; and

an interface means, arranged for interfacing with said processor for
communicating said data signals to an external processor device.

10 Said reader device may comprise:

an interface means, arranged for interfacing with said processor for
communicating said data signals to an external processor device, such that
inspection of information contained in data read from said programmable memory
15 device of said data storage device can be accessed on said external processor
device via said interface.

The library device may further comprise:

20 a read only memory means storing an operating system or operating said
processor to display said data items received from said received means; and

a display device arranged to display said data items read from said
programmable memory device.

25

The library device may comprise a means for emitting a power signal to said
data storage device, said power signal emitting means located in close proximity
to said cartridge port, for supply of power to said programmable memory device.

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According to a second aspect of the present invention there is provided a method of labeling a data storage device with information stored on a programmable memory device positioned externally on a casing of said data storage device, said method comprising the steps of:

5

placing said data storage device in a port of a reader device capable of reading data signals describing a data content stored on said programmable memory of said data storage device;

10

polling a detector device located in said port of said reader device for detecting said signals;

receiving said data signals describing a predetermined stored set of parameters concerning said data storage device;

15

storing said data signals in a memory device of said reader device; and

printing said predetermined set of data items on an area having a size and shape which fits on said data storage device.

20

Said step of printing said predetermined set of data items may comprise printing said predetermined set of data items on a label of a size and shape suitable for direct attachment to said data storage device.

25

Said step of printing may comprise printing said data items directly onto a cartridge of said data storage device.

30

Brief Description of the Drawings

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For a better understanding of the invention and to show how the same may be carried into effect, there will now be described by way of example only, specific embodiments, methods and processes according to the present invention with reference to the accompanying drawings in which:

5

Fig. 1 illustrates schematically a tape data storage cartridge having an embedded read/write memory accessible by means of a transponder unit within the cartridge, as is known in the prior art;

10

Fig. 2 illustrates schematically an installation of a second data storage media reader and labeling device in an automated data storage medium library having a rack and shelf arrangement accessible by a computer controlled robotic arm, according to a second specific embodiment of the present invention;

15

Fig. 3 illustrates schematically in greater detail, the reader-labeling device;

Fig. 4 illustrates schematically a control process operated in the reader labeling device by means of a set of command sequences;

20

Figs. 5A to 5G illustrates schematically displays of predetermined selected data items read from the data storage cartridge, and which appear on the display screen of the first reader-printer device;

25

Fig. 6 illustrates schematically an example of a layout of a label printed by the reader-printer device; and

Fig. 7 illustrates the second reader-labeling device used in stand alone context in a purpose designed casing having a power supply.

30

Detailed Description of the Best Mode for Carrying Out the Invention

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There will now be described by way of example the best mode contemplated by the inventors for carrying out the invention. In the following description numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent however, to one skilled in the art, that the present invention may be practised without limitation to these specific details. In other instances, well known methods and structures have not been described in detail so as not to unnecessarily obscure the present invention.

10 In order to remove errors in cartridge labeling and to improve the speed of labeling, a media-dependent labeling system is envisaged which is specific to a particular type or design of data storage media device. This uses information contained on a memory device located in the data storage cartridge (the media) to produce a printed cartridge label, where the label attributes can be selected by
15 the user. This system enables cartridge data to be assessed and the cartridge to be labelled without having to access the data stored on the magnetic tape and hence avoiding the use of a tape driver of a host device. As a result, the information concerning data contained in the cartridge can be assessed rapidly. By integrating a means of reading the information contained on the cartridge
20 memory device with a means of printing this information either directly to a pre-labelled cartridge or to a blank label all within one device, cartridge labels may be updated accurately and rapidly.

25 Labeling of a data storage device need not occur at a time when data is recorded on the data storage medium, but labeling can occur retrospectively, and away from a host device having a tape drive mechanism.

30 Additionally, the device may support multiple language sets and fonts for versatility in user readout. This will allow for versatility and accuracy in user access to cartridge data.

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Specific methods according to the present invention described herein are concerned with the reading of data from solid state memory devices located on data storage devices and writing this data to a memory area and the selection of 5 data from this memory area for display and printing.

In one embodiment, a media reader and printer device may be incorporated into a standard 5.25 inch device slot.

10 Referring to Fig. 1 herein, there is illustrated schematically a conventional prior art tape data storage cartridge device comprising a cartridge casing 100, containing one or a pair of reels on which is wound an elongate band of magnetic tape, comprising a high capacity data storage medium on which data may be recorded from a host device such as a computer server device, a personal 15 computer, a workstation, or a computer controlled test instrument. The cartridge contains a solid state programmable memory device 101 within the cartridge casing 100, the memory device comprising a transponder unit, and a read/write memory, which can be written to or read via the transponder unit, which can be inductively powered by an RF signal generated by a transmitter placed 20 immediately adjacent the cartridge casing, as is known in the art. The height, width, and length dimensions of the cartridge casing 100 and the general layout of the casing, including the positioning of the memory device 101 within the casing, are specific to the particular type and design of tape data storage cartridge. That is to say the layout of the cartridge is media specific.

25

Information about the cartridge and the data stored on the cartridge can be stored in the memory device 101. The data stored may include data describing file names of data on the tape, data describing customer information, data describing an application stored on the tape, data describing an amount of

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unused memory space remaining on the tape, and dates upon which files were stored.

Referring to Fig. 2 herein there is illustrated schematically a specific embodiment cartridge reader and labeling device 200 installed in situ in an automated data storage cartridge library comprising a shelf or rack 201, having a plurality of locations for storing a plurality of tape data storage cartridges; a automatic robotic arm 202 operable to select and access individual tape data storage cartridges, the robotic arm 202 travelling along a substantially linear track 203, the arm capable of moving in vertical and first and second lateral directions and being capable of removing tape cartridges from their location, physically transporting them to reader and labeling device 200, inserting and extracting the cartridges from the reader and labeling device 200 and returning them to their storage locations. The second reader and labeling device interfaces with an external computer 204 having a processor, and/or an external printer 205.

Referring to Fig. 3 herein, there is illustrated schematically in greater detail the reader-labeling device 200. The reader-labeling device comprises a casing 300 suitable for fitting into, a 5.25 inch standard computer casing port, having power supply terminals and interface terminals at a rear of the casing (interface terminal not shown), the interface terminal comprising a standard computer peripheral port, on a front face of the casing 300 there being provided a cartridge port 301 for accepting a tape data storage cartridge, in a manner such that the tape data storage cartridge when inserted into the port may have a remaining portion projecting and extending out of the port, allowing the robotic arm to grasp the cartridge for insertion and removal from the port; optionally, a display device 302, and a keypad entry device 303; a processor; a programmable memory area; a control interface; a read only memory (ROM) containing an operating system; and an interface for interfacing with external computer 204 and external printer 205. When installed in rack 201, the second reader-labeling device may be

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controlled and accessed externally from the external processor of computer 204 via the interface. The interface provides an external means of user input when the reader device is incorporated in a 5.25 inch device slot thus forming an integrated part of a larger system. This form of user input precludes the use of
5 the optional casing mounted keypad 303 for inputting commands or the casing mounted display screen 302 for outputting status. The optionally provided display device 302 and keypad entry device 303 may be used for manual operation of the second reader device, for inspection of a tape cartridge as an override to automatic reading and inspection of the tape cartridge information.

10

The processor has a relatively small amount of separate memory of the order of 1 MByte or less, and is limited practically by the smallest size of memory chip commercially available. Alternatively, the processor may be constructed integrally with memory area on a same chip, for example a known Power PC® chip.
15 In the best mode, to achieve compact size and ease of manufacture, the components are as integrated as possible with the processor, and preferably include a built-in operating system in read only memory ROM, on a same chip as the processor.

20

An aerial and receiver are used to receive data from the memory device 300 of the cartridge, which uses an electrically erasable programmable read only memory (EEPROM) as read/write memory area. With the data storage cartridge inserted in the reader device, the aerial, of the memory device, forms a contact less interface with the aerial of the reader device using an inductive coupling
25 scheme using a magnetic field to transmit data to the receiver 304. In the best mode, the protocol used to transmit information by the inductive coupling scheme is known as the MIFARE ® system developed by Phillips/Mikron of the type presently employed in "Smart" credit card technology for use in personal banking applications and which is known in the art. Advantages and features of this
30 system as used by the first embodiment include a high reliability, an operating

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frequency 13.56 MHz, and an anti-collision protocol, which provides an ability to handle several transponders in close proximity without interference.

The aerial of the reader and labeling device is positioned such that when a
5 tape cartridge having an aerial is positioned in the cartridge receiving means of the reader device, the two aerials are positioned a distance less than or equal to 20 mm from each other, so that inductive coupling can occur between the two aerials. Over such a range this yields coupling factors between aerials of the order 1 to 10% and transmission speeds of the order 100 Kbps between the
10 aerials. The receiver of the reader and labeling device transmits an inductive signal which is received by the transponder of the tape cartridge, and which powers the transponder memory storage device in the tape cartridge, such that the transponder is able to emit signals describing the content of the memory storage area across an air gap between the two aerials, which is received by
15 receiver. Alternatively, transmission of data signals between the memory device and the reader-labeling device may be within the infra-red range of frequencies.

Data read from the memory device 300 in this manner is written via the processor 305 to programmable random access memory, (RAM), where a copy
20 of all read data is maintained. Data stored in the RAM is displayed on the display screen 302 or is accessed via the external processor using the control interface.

Writeable, erasable and re-writeable labels may be directly provided on the tape data storage cartridges as supplied. Within casing 300, there is provided an
25 internal printing device, which is configured for printing directly onto a label on a tape data storage cartridge, when the tape data storage cartridge is located within the port 301.

Referring to Fig. 4 herein, a first mode of operation of the reader- labeling
30 device within the context of the automatic library system will now be described.

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In use, the reader device may be inaccessible to a user. The robotic arm 202 may be controlled by its own dedicated control systems to select and access a tape cartridge from a rack, as is conventionally known in the prior art. However, in the first mode of operation, the act of the robotic arm 202 placing a tape data storage cartridge into the cartridge slot of cartridge reader 200 activates a sensor internal to the cartridge receiving slot of the card reader which generates a signal to initiate a series of steps for printing label information directly to a writeable label portion of the tape data storage cartridge. The processor operates a series of control steps 400 to 406. A first mode of operation will now be described. The robot arm places a tape data cartridge into the receiving port 301 of the reader and labeling device, thereby locating the cartridge firmly in the device in a position where the transponder memory device of the cartridge lies in close physical proximity to the aerial and receiver of the reader and labeling device.

The processor under control of operating system stored in the ROM operates in an initial state 400, from which the cartridge port is periodically polled in step 401. All transponders within the operating range return a 10 byte alpha-numeric serial number. If no memory device is detected in the port in step 402, the cartridge port is presumed empty, and the processor idles through the initial state, and continues to poll the cartridge port in step 401. The cartridge slot is presumed empty if no serial number is returned. Consequently an external detector device incorporated in the cartridge port of the reader device may be polled in step 403 to check whether a cartridge is inserted into the port. If no cartridge is detected, the processor returns to initial state 400, continuously polling the cartridge slot in step 401 and/or polling the detector in step 403. If a memory device is detected in steps 403 or 401, the processor enters a memory device detected state 404 from which the processor reads data received by the receiver via the aerial. The receiver continuously transmits a power signal to the transponder in the tape cartridge in order to allow the transponder to transmit signals through the aerial containing data concerning the information stored on the read/write memory device. Transmission of the power signal across the air gap by the aerial may be

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dependent upon the sensor within the reader and labeling device casing being activated by insertion of a tape data storage cartridge.

In step 406, data read from the memory device through the receiver is directed by the processor into the random access memory. Data can be selected from the random access memory in step 407 for display on the display device in step 409. Display of data from the RAM is accessed through operation of a menu system in step 410. Initially, predetermined data, for example a serial number of the cartridge which has been read from the memory device may be displayed on the display device.

Referring to Figs. 5 herein, there are shown displays which may occur on the display 302 of the reader labeling device in the first mode of operation. Referring to Fig. 5A herein, there is illustrated schematically an example of information displayed on a display device, the information comprising a serial number of a tape cartridge. Upper and lower scroll icons 500, 501 may appear on the display, giving a visual indication to the operator that to access further items of data, the upper and lower scroll buttons of the keypad need to be activated. In step 410 a user may enter keypad entries, for example pressing a scroll button which scrolls through display items as illustrated in Figs. 5B to 5G herein under control of the operating system stored in the ROM of the reader labeling device, in the menu system. The operating system stored in the ROM is specifically configured from a knowledge of the format and layout of the information items stored as data in the memory device of the cartridge. By scrolling through the menu, by operating the keypad scroll buttons, display of the serial number of the tape, the date the tape was last used, an amount of memory remaining on the tape, names of back up sessions stored on the tape e.g. "Full Backup Monday 3/8/98", a number of times the tape has been used, a number of errors on the tape and an option to print a label containing a predetermined set of information items describing data stored on the tape may be accessed. If, in

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response to a 'print label' display as illustrated in Fig 5G, a key on the keypad is pressed, then in step 409, the processor sends a signal to the printer, along with signals describing the information to be printed on the label, which activates the printer to print a label. The label characteristics may be determined by user input
5 via the menu system 409. Characteristics include a chosen language set, font size and type, and in this way allow the user to customise the label as necessary. In step 407, data is selected from random access memory, and is directly printed to a writeable medium on the tape data cartridge in step 408. Printing is direct to the cartridge and printing may be activated by a sensor triggered on insertion of
10 the tape cartridge to the cartridge port.

In a second, automated mode of operation, an external computer device 204 comprising external processor, external display, external keypad and data entry device, e.g. a pointing device or mouse, and an external printer 205 may be
15 used to access the information stored on the memory device, externally of the automatic library. For example a PC, laptop or palmtop device connected to a printer device 205 may be used. In step 412, a user enters details on an external keypad, whilst viewing menu items displayed on the external display in step 413, which are transmitted from the reader-labeling device menu system via the
20 interface through a series of control interface steps 414. By activating keys on the external keypad, the user may activate an external print operation 415 of external printer 205 to print a label for the cartridge. Alternatively, printing need not be activated, but a user may automatically view information contained on the tape cartridges via the external computer device, e.g. palmtop or laptop
25 computer, which displays menu items on its screen.

Operation in the third mode is substantially similar as described herein above to the second mode, except when printing a label in step 415, the printer device within the casing 300 is activated externally via the interface in step 414,
30 by viewing an external display 413 and activating keys in step 412 from an

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external keypad, such that the data to be printed on the label may be viewed externally by a user on the external computer device, and printing, once activated by a user externally of the reader device 200, takes place internally of the reader device 200 and directly onto the cartridge within the port 401.

5

An example of a printed label is illustrated in Fig. 6 herein. The predetermined set of information items may be selected from the set: a serial number of the tape; a date the tape was last used; an amount of memory space remaining on the tape; a file name of a first file on the tape; a file name of the last 10 file on the tape, a name of a back up session stored on the tape. This list of predetermined selected information items is exemplary, and not exhaustive, and the exact information items which are printed on the label depend upon the exact information items which are stored on the memory on the cartridge tape, which are specific to the particular media format of the tape cartridge and reader-labeling device, as will be understood by those skilled in the art.

Referring to Fig. 7, in a variation of the second specific embodiment, the second reader-labeling device may be adapted, such that it can be removed from a standard 5.25 inch port contained within the automatic library, and a custom 20 made casing 700, e.g. a plastics moulding having an in-built power supply may be provided such that the second reader-labeling device can be removed from the automated library, inserted into the casing 700, from which it obtains power, and be used as a stand alone reader-labeling device for printing labels from data storage cartridges which are manually inserted into port 301.

25

The power supply in-built to the casing may comprise a bay for containing a plurality of conventional dry cell batteries, giving for example a 12v power supply, enabling stand alone operation. Alternatively, the power supply may comprise a rechargeable battery in-built into the casing. In a further option, the power supply 30 may comprise a transformer and voltage reducer built into the casing and

-19-

connectable to an external mains supply by a conventional mains supply lead and connector. A conventional connector at the rear of the second embodiment reader-labeling device may connect with the power supply within the casing, on inserting the second reader-labeling device into the casing in a sliding location
5 operation.

Operation in stand alone mode is by user simply inserting a data storage cartridge directly into the second reader-labeling device, which automatically reads data on the transponder device, and prints a pre-determined set of data
10 onto a print media directly attached to the data storage cartridge. The print media may comprise a pre-manufactured area comprising part of a plastics cartridge case, suitable for direct printing thereon, or alternatively a user may manually stick an adhesive paper label onto the printer cartridge prior to inserting into the second reader-labeling device, the printer printing directly to the label
15 attached to the data cartridge.

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Claims:

1. An automatic library device for storing a plurality of cartridge-type data storage devices, each having a casing containing a high capacity data storage medium, and having a programmable memory device attached to said 5 casing, said programmable memory device storing data describing said data storage device, said library device comprising:

a rack storage means having a plurality of receptacles for storing said plurality of said data storage devices;

10

an automatic selection means operable to select, retrieve and replace said data storage devices from said rack; and

15 a reader device capable of reading a data content stored on a said programmable data storage device, wherein said selection means is configured to present a said data storage medium to said reader device, said reader device being configured to read data signals from said data storage device and print said data onto a print media.

20 2. The library device as claimed in claim 1, wherein said reader device comprises a port configured to accept said cartridge type data storage device, and a printer device located in said port, said printer configured to print directly to a said data storage device when said data storage device is inserted in said port.

25 3. The library device as claimed in claim 1, wherein said reader device comprises:

a receiver means capable of receiving data signals from a said programmable memory of a said data storage device; and

30

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an interface means, arranged for interfacing with said processor for communicating said data signals to an external processor device.

4. The library device as claimed in claim 1, wherein said reader device
5 comprises:

an interface means, arranged for interfacing with said processor for communicating said data signals to an external processor device, such that inspection of information contained in data read from said programmable memory
10 device of said data storage device can be accessed on said external processor device via said interface.

5. The library device as claimed in claim 1, further comprising:

15 a read only memory means storing an operating system or operating said processor to display said data items received from said received means; and

a display device arranged to display said data items read from said programmable memory device.

20 6. The library device as claimed in claim 1, further comprising means for emitting a power signal to said data storage device, said power signal emitting means located in close proximity to said cartridge port, for supply of power to said programmable memory device.

25 7. A method of labeling a data storage device with information stored on a programmable memory device positioned externally on a casing of said data storage device, said method comprising the steps of:

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placing said data storage device in a port of a reader device capable of reading data signals describing a data content stored on said programmable memory of said data storage device;

5 polling a detector device located in said port of said reader device for detecting said signals;

receiving said data signals describing a predetermined stored set of parameters concerning said data storage device;

10

storing said data signals in a memory device of said reader device; and

printing said predetermined set of data items on an area having a size and shape which fits on said data storage device.

15

8. The method as claimed in claim 7, wherein said step of printing said predetermined set of data items on a label of a size and shape suitable for direct attachment to said data storage device.

20

9. The method as claimed in claim 7, wherein said step of printing comprises printing said data items directly onto a cartridge of said data storage device.

25

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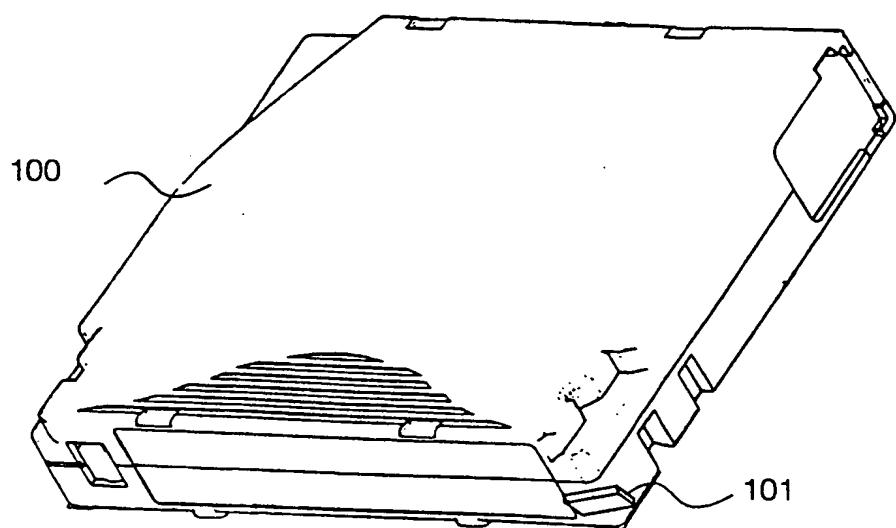


Fig. 1
(Prior Art)

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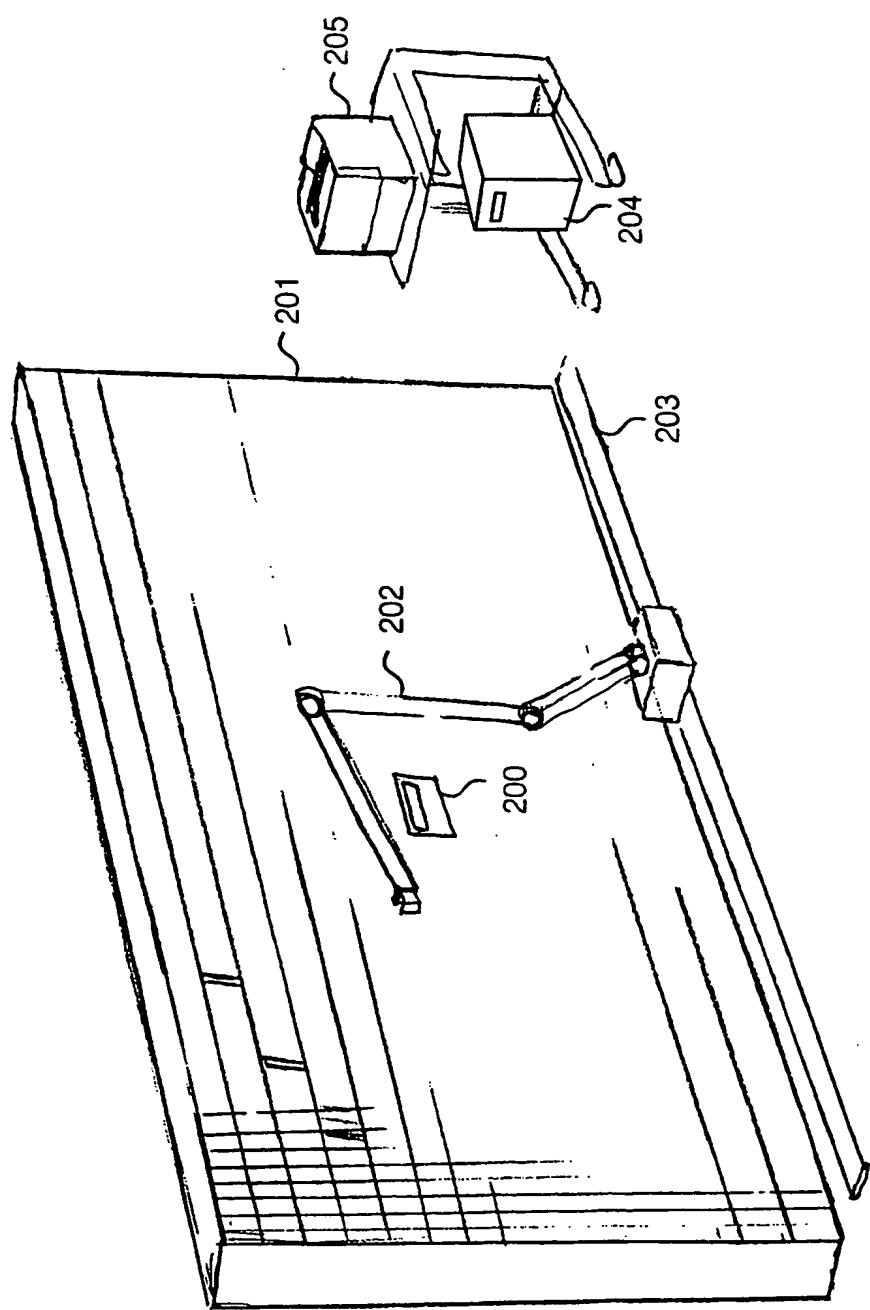


Fig. 2

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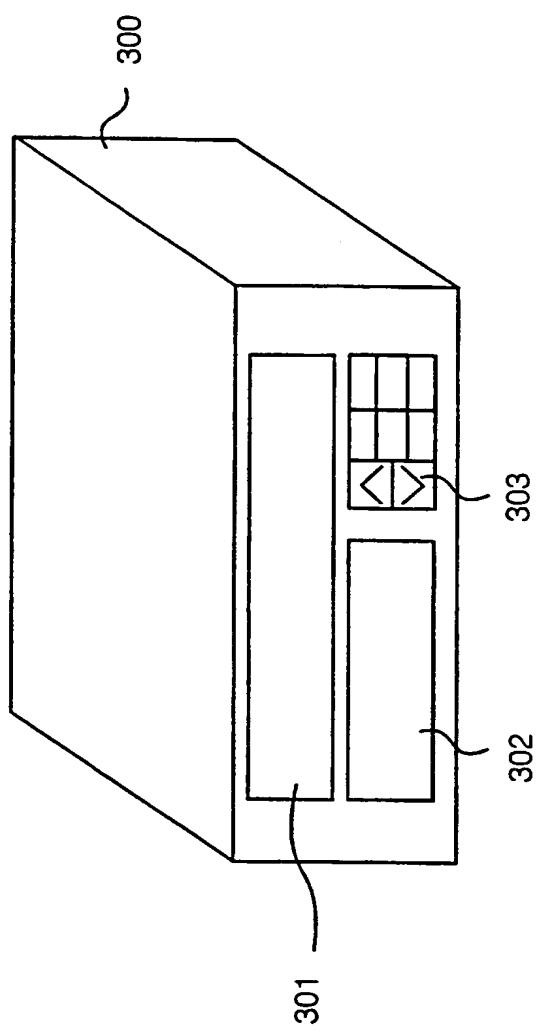


Fig. 3

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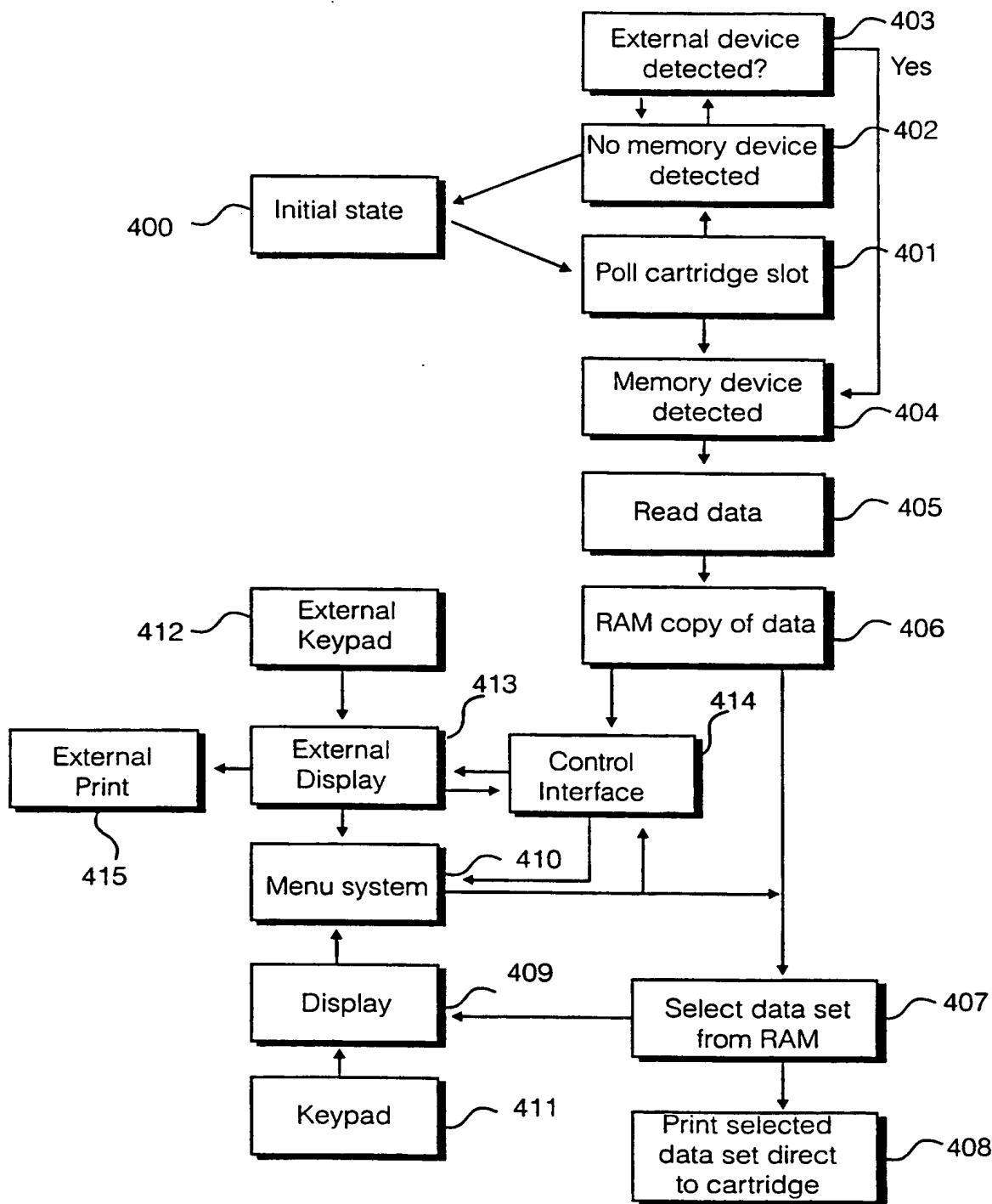


Fig. 4

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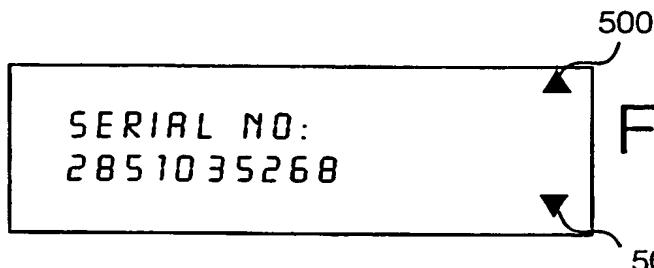


Fig. 5A

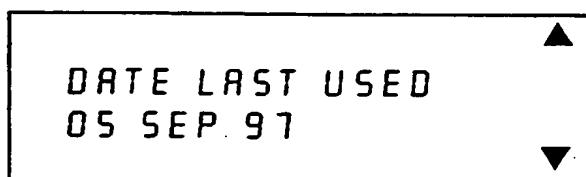


Fig. 5B

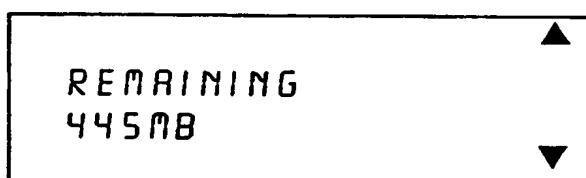


Fig. 5C

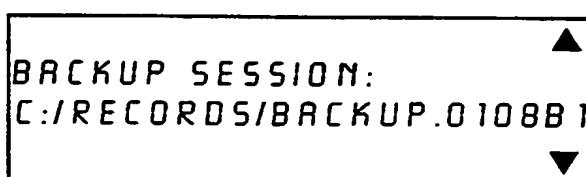


Fig. 5D

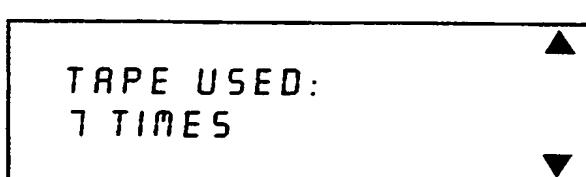


Fig. 5E

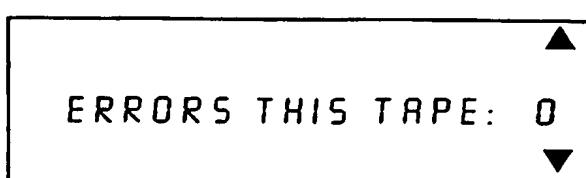


Fig. 5F

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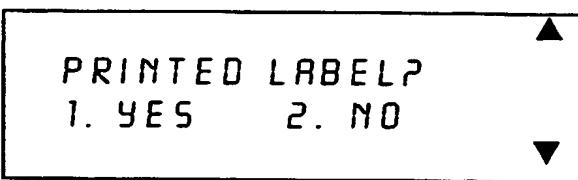


Fig. 5G

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Serial No: 2851035268 1st file: C:/Records.Backup.0108B1
Date Last Used: 05 Sep 97 Last file: C:/Records.Backup.0408B1
Space Remaining: 445MB

Fig. 6

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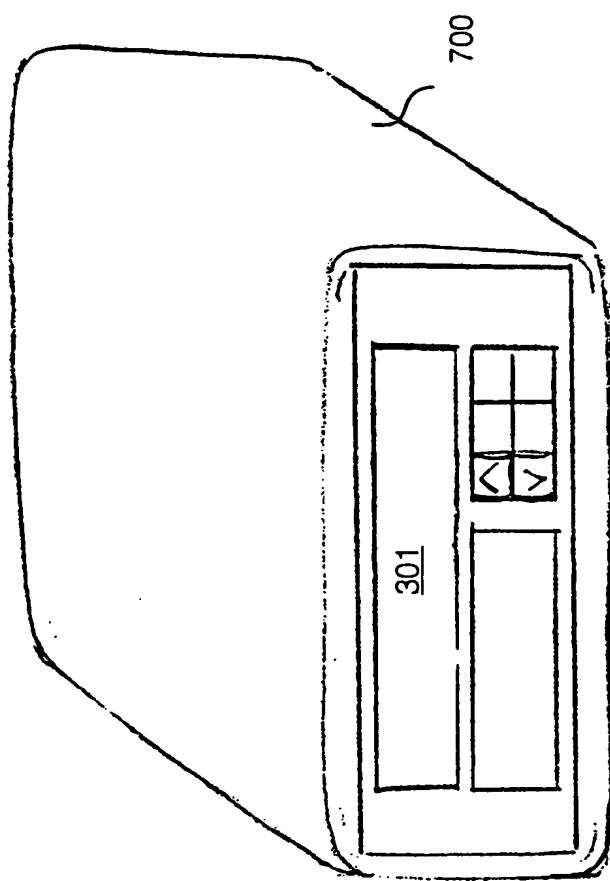


Fig. 7

INTERNATIONAL SEARCH REPORT

Int'l. Application No

PCT/GB-00/00679

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06K17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 455 409 A (BOWER JR ROBERT ET AL) 3 October 1995 (1995-10-03) column 1, line 53-65; claims 1,17; figures 1,4,8A-8D,14,15 column 5, line 56 -column 6, line 9 column 8, line 13 -column 10, line 2 column 10, line 55 -column 11, line 19 column 20, line 21 -column 22, line 60 column 26, line 10-32 —	1-9
Y	US 5 592 596 A (BALSM JAMES) 7 January 1997 (1997-01-07) column 1, line 18-28 column 2, line 14-37 column 4, line 32 -column 5, line 17 column 7, line 32-59; claims 3,4,6 —	1-9

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

11 April 2000

18/04/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Cardigos dos Reis, F

INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/GB-00/00679

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 121 687 A (ARCOTTA JOHN) 16 June 1992 (1992-06-16) the whole document -----	2

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int'l Application No

PCT/GB/00/00679

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US 5455409 A	03-10-1995	CA 2224168 A		03-01-1997
		WO 9700496 A		03-01-1997
US 5592596 A	07-01-1997	NONE		
US 5121687 A	16-06-1992	NONE		

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 30980107 W02	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 00679	International filing date (day/month/year) 25/02/2000	(Earliest) Priority Date (day/month/year) 24/03/1999
Applicant HEWLETT-PACKARD COMPANY et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.
 It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :
 - contained in the international application in written form.
 - filed together with the international application in computer readable form.
 - furnished subsequently to this Authority in written form.
 - furnished subsequently to this Authority in computer readable form.
 - the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
 - the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. Certain claims were found unsearchable (See Box I).3. Unity of Invention is lacking (see Box II).

4. With regard to the title,

- the text is approved as submitted by the applicant.
- the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- the text is approved as submitted by the applicant.
- the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

- as suggested by the applicant.
- because the applicant failed to suggest a figure.
- because this figure better characterizes the invention.

2

 Non of the figures.

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The abstract is changed as follows:

line 1: after 'device' insert '(200)';
line 10: after 'library' insert '(201)';
line 10: after 'arm' insert '(202)'.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00679

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06K17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 455 409 A (BOWER JR ROBERT ET AL) 3 October 1995 (1995-10-03) column 1, line 53-65; claims 1,17; figures 1,4,8A-8D,14,15 column 5, line 56 -column 6, line 9 column 8, line 13 -column 10, line 2 column 10, line 55 -column 11, line 19 column 20, line 21 -column 22, line 60 column 26, line 10-32 --- US 5 592 596 A (BALSMOM JAMES) 7 January 1997 (1997-01-07) column 1, line 18-28 column 2, line 14-37 column 4, line 32 -column 5, line 17 column 7, line 32-59; claims 3,4,6 --- -/-	1-9
Y		1-9

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the International filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the International search	Date of mailing of the International search report
---	--

11 April 2000

18/04/2000

Name and mailing address of the ISA
 European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
 Fax: (+31-70) 340-3016

Authorized officer

Cardigos dos Reis, F

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00679

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 121 687 A (ARCOTTA JOHN) 16 June 1992 (1992-06-16) the whole document -----	2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

P[REDACTED]GB 00/00679

Patent document cited in search report	Publication-date	Patent family member(s)	Publication date
US 5455409	A 03-10-1995	CA 2224168 A WO 9700496 A	03-01-1997 03-01-1997
US 5592596	A 07-01-1997	NONE	
US 5121687	A 16-06-1992	NONE	

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

REC'D 23 MAY 2001
WIPO PCT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 30980107 WO2	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB00/00679	International filing date (day/month/year) 25/02/2000	Priority date (day/month/year) 24/03/1999
International Patent Classification (IPC) or national classification and IPC G06K17/00		
<p>Applicant HEWLETT-PACKARD COMPANY et al.</p> <p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 22 sheets.</p> <p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application 		

Date of submission of the demand 24/10/2000	Date of completion of this report 21.05.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Grob, M Telephone No. +49 89 2399 2620



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/00679

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-19 as received on 08/03/2001 with letter of 07/03/2001

Claims, No.:

1-9 as received on 08/03/2001 with letter of 07/03/2001

Drawings, sheets:

1/8-8/8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/00679

the drawings, sheets:

5. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 1-9
	No:	Claims
Inventive step (IS)	Yes:	Claims 1-9
	No:	Claims
Industrial applicability (IA)	Yes:	Claims 1-9
	No:	Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re It m V**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Reference is made to the following documents:**

D1 = US-A-5 455 409

D2 = US-A-5 592 596

D3 = US-A-5 121 687

2. D1 discloses an apparatus for monitoring a library of magnetic tape cartridges 10. Each cartridge 10 (cf Fig 1) comprises a casing holding a reel of magnetic tape. In addition, a non-volatile memory device 18 is mounted on the front edge 14 of the cartridge 10 (cf col 8, lines 37-48) for storing a "volser" number (volume serial number) and history of tape usage. The cartridges 10 are stored in a number of tape carriers (racks) 12 (cf Fig 2). As shown in Fig 6, the tape carriers 12 are connected to a host computer 52 for monitoring the library of cartridges. The non-volatile memory devices 18 are programmed using a memory programmer unit 20 (cf Figs 8A-D) connected to the host computer 52 (cf col 10, line 50 et seq.). The "volser number is: a) keyed into the host computer 52 (cf Fig 8A and col 10, lines 60-67), b) entered into the host computer 52 via a bar code scanner which reads a bar code label on the cartridge 10 (cf Fig 8B and col 13, line 58 et seq.), or iii) read from the initial portion of the tape itself (cf Fig 8C and Fig 8D, cf col 14, line 18 et seq.). The "volser" number is then communicated to the programmer unit 20 and written into the non-volatile memory device 18 of the cartridge 10. When the host computer 52 receives a cartridge request containing the "volser" number, this information is transmitted to polling circuitry (cf Fig 13) in the respective tape carriers (racks) 12 to determine whether the selected cartridge is present within a receptacle of the carriers 12. The position of each carrier (rack) 12 in the monitoring system is stored in the memory of the microcontroller 300 (cf Fig 13 and col 25, line 5 et seq.) which forms a part of the circuit in the carrier (rack) 12. In order to program the carrier (rack) position into the EEPROM of the microcontroller 300, a portable position programmer 500 may be used (cf Fig 15, cf col 25, line 20 et seq.).

2.1 Although D1 discloses (cf col 8, lines 21-24) that "volser" numbers are printed on labels attached to the tape cartridges, D1 does not disclose a device for reading/receiving data **from the programmable memory device** (i.e. the memory 18 in D1) attached to or positioned on the casing of the data storage device and **printing said read\received^[1] data** onto a print medium\area. Hence, the subject-matter of each of the claims 1 and 7 is new compared to D1. Furthermore, with regard to claim 1, the library apparatus of D1 is not "automatic" in the sense that it does not comprise an automatic selection means operable to select, **retrieve and replace** said data storage devices from said rack (cf lines 11-12 of claim 1). In connection with this point, it is noted that the racks 12 in D1 have LEDs 32a (cf Fig 2 and col 6, lines 35-40) which indicate when slots are empty or when a cartridge should be removed etc. so as to assist the operator. Consequently, the cartridges are intended to be removed manually in D1.

[1] See section VIII, paragraph 1.

3. D2 discloses (cf Fig 1) a jukebox 40 for storing optical disks or magnetic cassette cartridges (cf col 1, lines 18-27). Under certain conditions, the jukebox of D1 triggers the printing of a label including the media ID associated with the selected optical disk cartridge (magnetic cassette cartridge). The printer can be integrated within the jukebox (cf col 4, line 45 et seq.). The printing of the label is triggered if a) a controller of the optical disk cartridge storage and retrieval device (jukebox) determines that a label flag is not associated with a selected one of a first number of optical disk cartridges, or b) a flag bit is set etc. (cf col 4, line 31 et seq.).
- 3.1 However, the optical disk cartridge storage and retrieval device of D2 does not have a device for reading\receiving data stored on a programmable memory device attached to or positioned on a casing of the data storage device (optical disk in D2). Hence, the subject-matter of each of the claims 1 and 7 is new with regard to D2. Moreover, even if it were possible to combine D1 and D2 (which is doubtful in view of the different types of storage devices used (magnetic tape cartridges, optical disks) as well as the very different designs), the resulting arrangement would still fail to suggest the idea of reading\receiving data stored on a programmable memory device attached to or positioned on a casing of the data storage device and printing this read\received data.

4. D3 discloses a machine for printing directly on cassette cartridges. D3 does not read/receive the data to be printed from a programmable memory device attached to or positioned on a casing of the data storage device.
5. It follows from the above paragraphs that the subject-matter of each of the independent claims 1 and 7 (as well as the dependent claims 2-6,8-9) is new and inventive and therefore the requirements of Articles 33(2)-33(4) PCT are met.

Re Item VII

Certain defects in the international application

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1-D3 is not mentioned in the description, nor are these documents identified therein.
 - 1.1 Contrary to Rule 5.1(a)(iii) PCT, the description on page 8 is not in conformity with claims 7 and 8. Furthermore, the description refers to "a **second** data storage media reader" or "a **second** specific embodiment" without ever disclosing the first reader/embodiment (cf page 9, lines 10,13,27; page 18, line 19; page 19, line 4).

Re Item VIII

Certain observations on the international application

1. In order to solve the problem of improving the speed of labelling cartridges (cf page 10, lines 11-12 of the description), it is essential that the data to be **printed** is **read from the EEPROM 101** rather than for example the magnetic tape (cf page 10, lines 16-17 of the description). However, the printing step of claim 7 (cf lines 14-16 on page 22) does not reflect said feature. Although the applicant admits in his reply dated 07.03.01 (cf paragraph 1.5) that the "**feature of printing said received data signals ... is included ... in claim 7**" (where the data signals are received from the programmable memory device), the printing step of claim 7 merely prints "a predetermined set of data items **describing a predetermined stored set of parameters concerning** said data storage device". Hence, unlike claim 1, claim 7 does not include a reference to **printing said read data**. Therefore, claim 7 does meet the clarity requirement of Article 6 PCT because it is

INTERNATIONAL PRELIMINARY

International application No. PCT/GB00/00679

EXAMINATION REPORT - SEPARATE SHEET

lacking an essential feature of the invention.

-1-

INTELLIGENT MEDIA READER AND LABEL PRINTER

Field of the Invention

The present invention relates to labelling of recording medium cartridges of
5 the type which include a memory device for storing information concerning the cartridge and data recorded on the recorded medium, and particularly although not exclusively it relates to the manner of reading this information and using it to produce a printed label containing all of, or a selected subset of this information.

10 Background to the Invention

In order to store digital electronic data, such as back-up data from a server computer device, it is known to use magnetic tape data storage cartridges comprising one or a pair of rotatable reels, and an elongate band of magnetic tape. A main reason for using such tape data storage cartridges is to make back
15 up copies of important data. Customers running large computer installations, or research and development facilities having significant amounts of data generated may have hundreds or thousands of tape data storage cartridges containing back up data, backed up from a wide range of different host devices such as servers and computer devices. Large collections of tape data storage cartridges tend to
20 be stored in centralised library locations, sometimes situated in fire proof safes or fire proof rooms. The library storage facility may be geographically remote from the host server devices, so that if there is destruction of data on the host devices, for example by a fire, the back up data remains safe. When a host device fails and data is lost, it is necessary to quickly locate the tape cartridge having the
25 latest back up data, which may be located in an offsite library.

These libraries include manual access libraries, where the cartridges are simply stored on shelves or in racks or boxes, with access to the cartridges being by manually picking up the cartridges, or automated libraries, where the

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cartridges are stored in predefined locations on a rack or shelf and are automatically accessed. In a manual access library, to identify a content of a tape cartridge a person may simply write out a label manually, describing the content of the data on the tape cartridge. This process is tedious and prone to
5 error. For example the wrong label might be put on the wrong tape, so that the contents of the label do not coincide with the data of the tape cartridge. Alternatively, tape cartridges have barcodes printed on their external cases, so conventionally finding a particular tape may involve using a barcode scanner to scan a plurality of barcode labels on a plurality of tape cartridges. In the case of
10 an automated library, robotic arms which are software controlled, deposit and collect cartridges in a rack, or shelf, and use a serial number of a tape data storage cartridge to determine a location within the library shelf or rack on which to store the cartridge. The rack or shelf is accessible by the robotic arm which may physically select a required tape on receipt of user instructions, the robotic
15 arm being moved under computer control to a cartridge storage location on the rack or shelf.

Conventionally, a person wishing to find an item of stored data on a cartridge will need firstly to identify the correct cartridge with the data on it, and
20 secondly identify a position of the data on the tape stored within the cartridge. In the case of single reel cartridges, the whole of the magnetic tape is wound on to the single cartridge whenever the cartridge is not in a tape drive mechanism. To find a particular item of data on a cartridge, a person must select the cartridge, put the cartridge into a conventional tape drive device, for example forming part
25 of a host personal computer, workstation, or computerised test equipment device, and view a content of the tape on a visual display unit forming part of the host computer, workstation or test equipment device. There is a time lag incurred in winding and rewinding the tape to identify a particular item of data.

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A current industry trend in tape data storage media is to supply a solid state transponder memory data storage device on or within a tape cartridge, on which can be stored information describing a data content of the tape. Examples of the type of information stored include file name and type, customer information, 5 system data backed-up, application and file space on the magnetic tape used or remaining. The information stored on such a memory device is upgraded when the magnetic tape is accessed using a known tape drive in a host computer having an integrated driver and read-write device, controlled by software resident on the host device. Many different types of tape data storage cartridge are used 10 in system backup and the location of the transponder memory storage device in relation to a casing of the tape cartridge varies between cartridge media types and is specific to the particular cartridge media type in each case.

To identify items of data stored on the tape cartridge, the memory device comprising part of the cartridge stores data as mentioned above, describing the file names, customer information, application and file space remaining on the tape or used on the tape, and dates of storage of files. A summary information describing the data items stored on the tape can be obtained by automatically interrogating the transponder memory storage device in the cartridge, which is 15 read by the tape drive device by inductive coupling to a transceiver chip forming part of the memory device, and which can be displayed on the visual display unit of the host device. Reading the content of the memory device involves physically picking up the data cartridge, putting the data cartridge in the tape drive of the host device, operating a keypad or pointing device, for example a mouse or 20 tracker ball, to select menu items from an application program on the host device, 25 in order to identify the information describing the data content of the tape.

In order to print a label for the tape, this involves running an application stored on the host device, perhaps manually entering the information describing 30 the data on the tape via a keyboard and/or pointing device and then printing out

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the label. A problem in printing a label for the tape cartridge by this mechanism is the time taken to print each label. For example, for a person wishing to find a particular item of data in a library, the first time a person enters the library on a particular day, he may have to pick an unlabeled tape cartridge which the person
5 thinks the data item may reside on, and in order to check the data on the cartridge needs to turn on the host computer device, wait for the host device to boot up and initialise, taking possibly a minute or two, select the application required for reading the memory device on the cartridge, again perhaps taking of the order of one or two minutes, and then read the data. If the data cartridge
10 does not contain the required data, then the person needs to remove the cartridge from the drive, which may or may not involve a delay in the software controlling the tape drive unit allowing the person to remove the tape, and then select a different tape from the shelf. For the second, subsequent tape cartridge inspected, the time delays will be shorter than inspecting the first data cartridge,
15 since the host device does not need to be booted up and initialised. However, there is still a significant delay in interrogating the memory device on the cartridge through the application software provided by the host device.

Having found the data cartridge containing the required data, in order to
20 print a label for attachment to the cartridge, the person needs to call up the application software for printing the label, perhaps enter details describing the cartridge manually into the printing application software, using a keyboard and/or pointing device and before printing make sure that an attached printer device is turned on. In order to turn the printing device on, the printing device may go
25 through a print initialisation routine, which in the case of an inkjet printer may take several minutes if used for the first time on a particular day, and providing there is sufficient print medium in the printer device, then a label can be printed. However, since many printer devices use paper as a print medium, it may be necessary to find and insert sheets of adhesive labels into the printer in order to
30 print out an adhesive label for the tape cartridge.

Therefore, conventionally it may take anything of the order of 10 to 15 minutes to print a label for a data cartridge, including all the time delays involved in booting up a host device and initialising a printer. Additionally, this assumes

5 that a host computer device is available at the location of the library, which it may not be, in which case an additional delay is incurred in taking the tapes to the host device for the data to be reloaded. Although the time delay taken to print a label for subsequent tape cartridges after the first will reduce per cartridge, the cataloguing and identification of data stored on existing legacy libraries of tape

10 data storage cartridges is a time consuming process, whether the library is a manual access library, or an automated library having a robotic device for selected cartridges.

In all cases, in order to improve ease and accuracy of access to the required data, a system for checking the data stored on a tape and labeling the tape accurately will be of benefit.

Summary of the Invention

Specific embodiments and methods according to the present invention aim

20 to improve the speed and accuracy of access of data contained on a plurality of data storage cartridges in a library of such cartridges.

The specific embodiments and methods disclosed herein aim to provide improved protection against loss of data by providing a rapid and accurate means

25 of locating backed-up data required to restore lost data to a system.

Specific methods according to the present invention, recognise that information contained on transponder memory devices in a data storage cartridge can be used to provide a rapid means of access to a data set which can be

30 utilised to identify the cartridge and to produce a cartridge label.

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Conceptually, the specific embodiments of the invention aim to provide an integrated printer with built-in radio frequency capability to read information stored on a memory device integrated into a data storage medium cartridge casing which automatically prints the information read from the memory device in a pre-formatted user-readable form on a label suited to the specific cartridge casing type.

According to first aspect of the present invention there is provided an automatic library device for storing a plurality of cartridge type data storage devices each having a casing containing a high capacity data storage medium, and having a programmable memory device attached to said casing, said programmable memory device storing data describing said data storage device, said library device comprising:

a rack storage means having a plurality of receptacles for storing said plurality of said data storage devices;

an automatic selection means operable to select, retrieve and replace said data storage devices from said rack; and

a reader device capable of reading a data content stored on a said programmable memory device, wherein said selection means is configured to present a said data storage medium to said reader device, said reader device being configured to read data signals from said programmable memory device, of said data storage device, and print said read data onto a print medium.

Preferably said reader device comprises a port configured to accept said cartridge type data storage device, and a printer device located in said port, said printer configured to print directly to a said data storage device when said data storage device is inserted in said port.

Said reader device may comprise:

5 a receiver means capable of receiving data signals from a said
programmable memory of a said data storage device; and

an interface means, arranged for interfacing with said processor for
communicating said data signals to an external processor device.

10 Said reader device may comprise:

15 an interface means, arranged for interfacing with said processor for
communicating said data signals to an external processor device, such that
inspection of information contained in data read from said programmable memory
device of said data storage device can be accessed on said external processor
device via said interface.

The library device may further comprise:

20 a read only memory means storing an operating system or operating said
processor to display said data items received from said received means; and

a display device arranged to display said data items read from said
programmable memory device.

25

The library device may comprise a means for emitting a power signal to said
data storage device, said power signal emitting means located in close proximity
to said cartridge port, for supply of power to said programmable memory device.

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According to a second aspect of the present invention there is provided a method of labeling a data storage device with information stored on a programmable memory device positioned externally on a casing of said data storage device, said method comprising the steps of:

5

placing said data storage device in a port of a reader device capable of reading data signals describing a data content stored on said programmable memory of said data storage device;

10

polling a detector device located in said port of said reader device for detecting said signals;

receiving said data signals describing a predetermined stored set of parameters concerning said data storage device;

15

storing said data signals in a memory device of said reader device; and

printing said predetermined set of data items on an area having a size and shape which fits on said data storage device.

20

Said step of printing said predetermined set of data items may comprise printing said predetermined set of data items on a label of a size and shape suitable for direct attachment to said data storage device.

25

Said step of printing may comprise printing said data items directly onto a cartridge of said data storage device.

30

Brief Description of the Drawings

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For a better understanding of the invention and to show how the same may be carried into effect, there will now be described by way of example only, specific embodiments, methods and processes according to the present invention with reference to the accompanying drawings in which:

5

Fig. 1 illustrates schematically a tape data storage cartridge having an embedded read/write memory accessible by means of a transponder unit within the cartridge, as is known in the prior art;

10

Fig. 2 illustrates schematically an installation of a second data storage media reader and labeling device in an automated data storage medium library having a rack and shelf arrangement accessible by a computer controlled robotic arm, according to a second specific embodiment of the present invention;

15

Fig. 3 illustrates schematically in greater detail, the reader-labeling device;

Fig. 4 illustrates schematically a control process operated in the reader labeling device by means of a set of command sequences;

20

Figs. 5A to 5G illustrates schematically displays of predetermined selected data items read from the data storage cartridge, and which appear on the display screen of the first reader-printer device;

25

Fig. 6 illustrates schematically an example of a layout of a label printed by the reader-printer device; and

Fig. 7 illustrates the second reader-labeling device used in stand alone context in a purpose designed casing having a power supply.

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Detailed Description of the Best Mod for Carrying Out the Invention

There will now be described by way of example the best mode contemplated by the inventors for carrying out the invention. In the following description numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent however, to one skilled in the art, that the present invention may be practised without limitation to these specific details. In other instances, well known methods and structures have not been described in detail so as not to unnecessarily obscure the present invention.

10

In order to remove errors in cartridge labeling and to improve the speed of labeling, a media-dependent labeling system is envisaged which is specific to a particular type or design of data storage media device. This uses information contained on a memory device located in the data storage cartridge (the media) 15 to produce a printed cartridge label, where the label attributes can be selected by the user. This system enables cartridge data to be assessed and the cartridge to be labelled without having to access the data stored on the magnetic tape and hence avoiding the use of a tape driver of a host device. As a result, the information concerning data contained in the cartridge can be assessed rapidly. 20 By integrating a means of reading the information contained on the cartridge memory device with a means of printing this information either directly to a pre-labelled cartridge or to a blank label all within one device, cartridge labels may be updated accurately and rapidly.

25

Labeling of a data storage device need not occur at a time when data is recorded on the data storage medium, but labeling can occur retrospectively, and away from a host device having a tape drive mechanism.

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Additionally, the device may support multiple language sets and fonts for versatility in user readout. This will allow for versatility and accuracy in user access to cartridge data.

5 Specific methods according to the present invention described herein are concerned with the reading of data from solid state memory devices located on data storage devices and writing this data to a memory area and the selection of data from this memory area for display and printing.

10 In one embodiment, a media reader and printer device may be incorporated into a standard 5.25 inch device slot.

Referring to Fig. 1 herein, there is illustrated schematically a conventional prior art tape data storage cartridge device comprising a cartridge casing 100, containing one or a pair of reels on which is wound an elongate band of magnetic tape, comprising a high capacity data storage medium on which data may be recorded from a host device such as a computer server device, a personal computer, a workstation, or a computer controlled test instrument. The cartridge contains a solid state programmable memory device 101 within the cartridge casing 100, the memory device comprising a transponder unit, and a read/write memory, which can be written to or read via the transponder unit, which can be inductively powered by an RF signal generated by a transmitter placed immediately adjacent the cartridge casing, as is known in the art. The height, width, and length dimensions of the cartridge casing 100 and the general layout of the casing, including the positioning of the memory device 101 within the casing, are specific to the particular type and design of tape data storage cartridge. That is to say the layout of the cartridge is media specific.

Information about the cartridge and the data stored on the cartridge can be
30 stored in the memory device 101. The data stored may include data describing

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file names of data on the tape, data describing customer information, data describing an application stored on the tape, data describing an amount of unused memory space remaining on the tape, and dates upon which files were stored.

5

Referring to Fig. 2 herein there is illustrated schematically a specific embodiment cartridge reader and labeling device 200 installed in situ in an automated data storage cartridge library comprising a shelf or rack 201, having a plurality of locations for storing a plurality of tape data storage cartridges; a 10 automatic robotic arm 202 operable to select and access individual tape data storage cartridges, the robotic arm 202 travelling along a substantially linear track 203, the arm capable of moving in vertical and first and second lateral directions and being capable of removing tape cartridges from their location, physically transporting them to reader and labeling device 200, inserting and extracting the 15 cartridges from the reader and labelling device 200 and returning them to their storage locations. The reader and labelling device interfaces with an external computer 204 having a processor, and/or an external printer 205.

Referring to Fig. 3 herein, there is illustrated schematically in greater detail 20 the reader-labelling device 200. The reader-labelling device comprises a casing 300 suitable for fitting into, a 5.25 inch standard computer casing port, having power supply terminals and interface terminals at a rear of the casing (interface terminal not shown), the interface terminal comprising a standard computer peripheral port, on a front face of the casing 300 there being provided a cartridge 25 port 301 for accepting a tape data storage cartridge, in a manner such that the tape data storage cartridge when inserted into the port may have a remaining portion projecting and extending out of the port, allowing the robotic arm to grasp the cartridge for insertion and removal from the port; optionally, a display device 302, and a keypad entry device 303; a processor; a programmable memory area; 30 a control interface; a read only memory (ROM) containing an operating system;

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and an interface for interfacing with external computer 204 and external printer 205. When installed in rack 201, the reader-labelling device may be controlled and accessed externally from the external processor of computer 204 via the interface. The interface provides an external means of user input when the reader
5 device is incorporated in a 5.25 inch device slot thus forming an integrated part of a larger system. This form of user input precludes the use of the optional casing mounted keypad 303 for inputting commands or the casing mounted display screen 302 for outputting status. The optionally provided display device 302 and keypad entry device 303 may be used for manual operation of the reader device,
10 for inspection of a tape cartridge as an override to automatic reading and inspection of the tape cartridge information.

The processor has a relatively small amount of separate memory of the order of 1 MByte or less, and is limited practically by the smallest size of memory
15 chip commercially available. Alternatively, the processor may be constructed integrally with memory area on a same chip, for example a known Power PC® chip. In the best mode, to achieve compact size and ease of manufacture, the components are as integrated as possible with the processor, and preferably include a built-in operating system in read only memory ROM, on a same chip as
20 the processor.

An aerial and receiver are used to receive data from the memory device 300 of the cartridge, which uses an electrically erasable programmable read only memory (EEPROM) as read/write memory area. With the data storage cartridge
25 inserted in the reader device, the aerial, of the memory device, forms a contact less interface with the aerial of the reader device using an inductive coupling scheme using a magnetic field to transmit data to the receiver 304. In the best mode, the protocol used to transmit information by the inductive coupling scheme is known as the MIFARE ® system developed by Phillips/Mikron of the type
30 presently employed in "Smart" credit card technology for use in personal banking

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applications and which is known in the art. Advantages and features of this system as used by the first embodiment include a high reliability, an operating frequency 13.56 MHz, and an anti-collision protocol, which provides an ability to handle several transponders in close proximity without interference.

5

The aerial of the reader and labeling device is positioned such that when a tape cartridge having an aerial is positioned in the cartridge receiving means of the reader device, the two aerials are positioned a distance less than or equal to 20 mm from each other, so that inductive coupling can occur between the two 10 aerials. Over such a range this yields coupling factors between aerials of the order 1 to 10% and transmission speeds of the order 100 Kbps between the aerials. The receiver of the reader and labeling device transmits an inductive signal which is received by the transponder of the tape cartridge, and which powers the transponder memory storage device in the tape cartridge, such that 15 the transponder is able to emit signals describing the content of the memory storage area across an air gap between the two aerials, which is received by receiver. Alternatively, transmission of data signals between the memory device and the reader-labeling device may be within the infra-red range of frequencies.

20

Data read from the memory device 300 in this manner is written via the processor 305 to programmable random access memory, (RAM), where a copy of all read data is maintained. Data stored in the RAM is displayed on the display screen 302 or is accessed via the external processor using the control interface.

25

Writeable, erasable and re-writeable labels may be directly provided on the tape data storage cartridges as supplied. Within casing 300, there is provided an internal printing device, which is configured for printing directly onto a label on a tape data storage cartridge, when the tape data storage cartridge is located within the port 301.

30

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Referring to Fig. 4 herein, a first mode of operation of the reader-labeling device within the context of the automatic library system will now be described. In use, the reader device may be inaccessible to a user. The robotic arm 202 may be controlled by its own dedicated control systems to select and access a 5 tape cartridge from a rack, as is conventionally known in the prior art. However, in the first mode of operation, the act of the robotic arm 202 placing a tape data storage cartridge into the cartridge slot of cartridge reader 200 activates a sensor internal to the cartridge receiving slot of the card reader which generates a signal to initiate a series of steps for printing label information directly to a writeable 10 label portion of the tape data storage cartridge. The processor operates a series of control steps 400 to 406. A first mode of operation will now be described. The robot arm places a tape data cartridge into the receiving port 301 of the reader and labeling device, thereby locating the cartridge firmly in the device in a position where the transponder memory device of the cartridge lies in close 15 physical proximity to the aerial and receiver of the reader and labeling device. The processor under control of operating system stored in the ROM operates in an initial state 400, from which the cartridge port is periodically polled in step 401. All transponders within the operating range return a 10 byte alpha-numeric serial number. If no memory device is detected in the port in step 402, the cartridge 20 port is presumed empty, and the processor idles through the initial state, and continues to poll the cartridge port in step 401. The cartridge slot is presumed empty if no serial number is returned. Consequently an external detector device incorporated in the cartridge port of the reader device may be polled in step 403 to check whether a cartridge is inserted into the port. If no cartridge is detected, 25 the processor returns to initial state 400, continuously polling the cartridge slot in step 401 and/or polling the detector in step 403. If a memory device is detected in steps 403 or 401, the processor enters a memory device detected state 404 from which the processor reads data received by the receiver via the aerial. The receiver continuously transmits a power signal to the transponder in the tape 30 cartridge in order to allow the transponder to transmit signals through the aerial

containing data concerning the information stored on the read/write memory device. Transmission of the power signal across the air gap by the aerial may be dependent upon the sensor within the reader and labeling device casing being activated by insertion of a tape data storage cartridge.

5

In step 406, data read from the memory device through the receiver is directed by the processor into the random access memory. Data can be selected from the random access memory in step 407 for display on the display device in step 409. Display of data from the RAM is accessed through operation of a 10 menu system in step 410. Initially, predetermined data, for example a serial number of the cartridge which has been read from the memory device may be displayed on the display device.

Referring to Figs. 5 herein, there are shown displays which may occur on 15 the display 302 of the reader labeling device in the first mode of operation. Referring to Fig. 5A herein, there is illustrated schematically an example of information displayed on a display device, the information comprising a serial number of a tape cartridge. Upper and lower scroll icons 500, 501 may appear on the display, giving a visual indication to the operator that to access further 20 items of data, the upper and lower scroll buttons of the keypad need to be activated. In step 410 a user may enter keypad entries, for example pressing a scroll button which scrolls through display items as illustrated in Figs. 5B to 5G herein under control of the operating system stored in the ROM of the reader labeling device, in the menu system. The operating system stored in the ROM is 25 specifically configured from a knowledge of the format and layout of the information items stored as data in the memory device of the cartridge. By scrolling through the menu, by operating the keypad scroll buttons, display of the serial number of the tape, the date the tape was last used, an amount of memory remaining on the tape, names of back up sessions stored on the tape e.g. "Full 30 Backup Monday 3/8/98", a number of times the tape has been used, a number of

errors on the tape and an option to print a label containing a predetermined set of information items describing data stored on the tape may be accessed. If, in response to a 'print label' display as illustrated in Fig 5G, a key on the keypad is pressed, then in step 409, the processor sends a signal to the printer, along with
5 signals describing the information to be printed on the label, which activates the printer to print a label. The label characteristics may be determined by user input via the menu system 409. Characteristics include a chosen language set, font size and type, and in this way allow the user to customise the label as necessary.
In step 407, data is selected from random access memory, and is directly printed
10 to a writeable medium on the tape data cartridge in step 408. Printing is direct to the cartridge and printing may be activated by a sensor triggered on insertion of the tape cartridge to the cartridge port.

In a second, automated mode of operation, an external computer device
15 204 comprising external processor, external display, external keypad and data entry device, e.g. a pointing device or mouse, and an external printer 205 may be used to access the information stored on the memory device, externally of the automatic library. For example a PC, laptop or palmtop device connected to a printer device 205 may be used. In step 412, a user enters details on an external
20 keypad, whilst viewing menu items displayed on the external display in step 413, which are transmitted from the reader-labeling device menu system via the interface through a series of control interface steps 414. By activating keys on the external keypad, the user may activate an external print operation 415 of external printer 205 to print a label for the cartridge. Alternatively, printing need
25 not be activated, but a user may automatically view information contained on the tape cartridges via the external computer device, e.g. palmtop or laptop computer, which displays menu items on its screen.

Operation in the third mode is substantially similar as described herein
30 above to the second mode, except when printing a label in step 415, the printer

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device within the casing 300 is activated externally via the interface in step 414, by viewing an external display 413 and activating keys in step 412 from an external keypad, such that the data to be printed on the label may be viewed externally by a user on the external computer device, and printing, once activated
5 by a user externally of the reader device 200, takes place internally of the reader device 200 and directly onto the cartridge within the port 401.

An example of a printed label is illustrated in Fig. 6 herein. The predetermined set of information items may be selected from the set: a serial
10 number of the tape; a date the tape was last used; an amount of memory space remaining on the tape; a file name of a first file on the tape; a file name of the last file on the tape, a name of a back up session stored on the tape. This list of predetermined selected information items is exemplary, and not exhaustive, and the exact information items which are printed on the label depend upon the exact
15 information items which are stored on the memory on the cartridge tape, which are specific to the particular media format of the tape cartridge and reader-labelling device, as will be understood by those skilled in the art.

Referring to Fig. 7, in a variation of the second specific embodiment, the
20 reader-labelling device may be adapted, such that it can be removed from a standard 5.25 inch port contained within the automatic library, and a custom made casing 700, e.g. a plastics moulding having an in-built power supply may be provided such that the reader-labelling device can be removed from the automated library, inserted into the casing 700, from which it obtains power, and
25 be used as a stand alone reader-labeling device for printing labels from data storage cartridges which are manually inserted into port 301.

The power supply in-built to the casing may comprise a bay for containing a plurality of conventional dry cell batteries, giving for example a 12v power supply,
30 enabling stand alone operation. Alternatively, the power supply may comprise a

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rechargeable battery in-built into the casing. In a further option, the power supply may comprise a transformer and voltage reducer built into the casing and connectable to an external mains supply by a conventional mains supply lead and connector. A conventional connector at the rear of the second embodiment

5 reader-labeling device may connect with the power supply within the casing, on inserting the reader-labelling device into the casing in a sliding location operation.

Operation in stand alone mode is by user simply inserting a data storage cartridge directly into the reader-labelling device, which automatically reads data

10 on the transponder device, and prints a pre-determined set of data onto a print media directly attached to the data storage cartridge. The print media may comprise a pre-manufactured area comprising part of a plastics cartridge case, suitable for direct printing thereon, or alternatively a user may manually stick an adhesive paper label onto the printer cartridge prior to inserting into the reader-

15 labelling device, the printer printing directly to the label attached to the data cartridge.

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Claims:

1. An automatic library device for storing a plurality of cartridge-type data storage devices, each having a casing (100) containing a high capacity data storage medium, and having a programmable memory device (101) attached to
5 said casing, said programmable memory device storing data describing said data storage device, said library device comprising:

a rack storage means (201) having a plurality of receptacles for storing said plurality of said data storage devices;

10

an automatic selection means (202) operable to select, retrieve and replace said data storage devices from said rack; and

15 a reader device (200) capable of reading a data content stored on a said programmable memory device, wherein said selection means is configured to present a said data storage device to said reader device, said reader device being configured to read data signals from said programmable memory device (101) of said data storage device and print said read data onto a print medium.

20 2. The library device as claimed in claim 1, wherein said reader device (200) comprises a port configured to accept said cartridge type data storage device, and a printer device located in said port, said printer configured to print directly to a said data storage device when said data storage device is inserted in said port.

25

3. The library device as claimed in claim 1, wherein said reader device (200) comprises:

30 a receiver means capable of receiving data signals from a said programmable memory of a said data storage device; and

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an interface means, arranged for interfacing with a processor for communicating said data signals to an external processor device.

5 4. The library device as claimed in claim 1, wherein said reader device comprises:

an interface means, arranged for interfacing with a processor for communicating said data signals to an external processor device, such that
10 inspection of information contained in data read from said programmable memory device of said data storage device can be accessed on said external processor device via said interface.

5. The library device as claimed in claim 1, further comprising:

15 a read only memory means storing an operating system or operating a processor to display said data items received from said received means; and

20 a display device (302) arranged to display said data items read from said programmable memory device.

6. The library device as claimed in claim 1, further comprising means for emitting a power signal to said data storage device, said power signal emitting means located in close proximity to said cartridge port, for supply of power to said
25 programmable memory device.

7. A method of labelling a data storage device with information stored on a programmable memory device (101) positioned externally on a casing (100) of said data storage device, said method comprising the steps of:

30

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placing said data storage device in a port of a reader device capable of reading data signals describing a data content stored on said programmable memory device (101) of said data storage device;

5 polling a detector device (401) located in said port of said reader device for detecting said signals;

10 receiving from said programmable memory device (101) data signals describing a predetermined stored set of parameters concerning said data storage device;

storing said data signals in a memory device of said reader device; and

15 printing (415) a predetermined set of data items describing a predetermined stored set of parameters concerning said data storage device, on an area having a size and shape which fits on said data storage device.

20 8. The method as claimed in claim 7, wherein said step (415) of printing comprises printing on a label of a size and shape suitable for direct attachment to said data storage device.

9. The method as claimed in claim 7, wherein said step (415) of printing comprises printing said data items directly onto a cartridge of said data storage device.

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Lawman, Matthew John M.
HEWLETT-PACKARD Limited
Intellectual Property Section
Filton Road
Stoke Gifford
Bristol BS34 8QZ
GRANDE BRETAGNE

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Applicant's or agent's file reference
30980107 WO2

IMPORTANT NOTIFICATION

International application No. PCT/GB00/00679	International filing date (day/month/year) 25/02/2000	Priority date (day/month/year) 24/03/1999
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Applicant
HEWLETT-PACKARD COMPANY et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/ European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Novelli, C Tel.+49 89 2399-8641
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 30980107 WO2	FOR FURTHER ACTION		See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB00/00679	International filing date (day/month/year) 25/02/2000	Priority date (day/month/year) 24/03/1999	
International Patent Classification (IPC) or national classification and IPC G06K17/00			
Applicant HEWLETT-PACKARD COMPANY et al.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 22 sheets.

3. This report contains indications relating to the following items:

- I Basis of the report
- II Priority
- III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV Lack of unity of invention
- V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI Certain documents cited
- VII Certain defects in the international application
- VIII Certain observations on the international application

Date of submission of the demand 24/10/2000	Date of completion of this report 21.05.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Grob, M Telephone No. +49 89 2399 2620



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/00679

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-19	as received on	08/03/2001 with letter of	07/03/2001
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Claims, No.:

1-9	as received on	08/03/2001 with letter of	07/03/2001
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Drawings, sheets:

1/8-8/8	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/00679

the drawings, sheets:

5. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-9
	No: Claims
Inventive step (IS)	Yes: Claims 1-9
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-9
	No: Claims

**2. Citations and explanations
see separate sheet**

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

D1 = US-A-5 455 409

D2 = US-A-5 592 596

D3 = US-A-5 121 687

2. D1 discloses an apparatus for monitoring a library of magnetic tape cartridges 10. Each cartridge 10 (cf Fig 1) comprises a casing holding a reel of magnetic tape. In addition, a non-volatile memory device 18 is mounted on the front edge 14 of the cartridge 10 (cf col 8, lines 37-48) for storing a "volser" number (volume serial number) and history of tape usage. The cartridges 10 are stored in a number of tape carriers (racks) 12 (cf Fig 2). As shown in Fig 6, the tape carriers 12 are connected to a host computer 52 for monitoring the library of cartridges. The non-volatile memory devices 18 are programmed using a memory programmer unit 20 (cf Figs 8A-D) connected to the host computer 52 (cf col 10, line 50 et seq.). The "volser number is: a) keyed into the host computer 52 (cf Fig 8A and col 10, lines 60-67), b) entered into the host computer 52 via a bar code scanner which reads a bar code label on the cartridge 10 (cf Fig 8B and col 13, line 58 et seq.), or iii) read from the initial portion of the tape itself (cf Fig 8C and Fig 8D, cf col 14, line 18 et seq.). The "volser" number is then communicated to the programmer unit 20 and written into the non-volatile memory device 18 of the cartridge 10. When the host computer 52 receives a cartridge request containing the "volser" number, this information is transmitted to polling circuitry (cf Fig 13) in the respective tape carriers (racks) 12 to determine whether the selected cartridge is present within a receptacle of the carriers 12. The position of each carrier (rack) 12 in the monitoring system is stored in the memory of the microcontroller 300 (cf Fig 13 and col 25, line 5 et seq.) which forms a part of the circuit in the carrier (rack) 12. In order to program the carrier (rack) position into the EEPROM of the microcontroller 300, a portable position programmer 500 may be used (cf Fig 15, cf col 25, line 20 et seq.).

EXAMINATION REPORT - SEPARATE SHEET

2.1 Although D1 discloses (cf col 8, lines 21-24) that "volser" numbers are printed on labels attached to the tape cartridges, D1 does not disclose a device for reading/receiving data **from the programmable memory device** (i.e. the memory 18 in D1) attached to or positioned on the casing of the data storage device and **printing said read\received^[1] data onto a print medium\area**. Hence, the subject-matter of each of the claims 1 and 7 is new compared to D1. Furthermore, with regard to claim 1, the library apparatus of D1 is not "automatic" in the sense that it does not comprise an automatic selection means operable to select, **retrieve and replace** said data storage devices from said rack (cf lines 11-12 of claim 1). In connection with this point, it is noted that the racks 12 in D1 have LEDs 32a (cf Fig 2 and col 6, lines 35-40) which indicate when slots are empty or when a cartridge should be removed etc. so as to assist the operator. Consequently, the cartridges are intended to be removed manually in D1.

[1] See section VIII, paragraph 1.

3. D2 discloses (cf Fig 1) a jukebox 40 for storing optical disks or magnetic cassette cartridges (cf col 1, lines 18-27). Under certain conditions, the jukebox of D1 triggers the printing of a label including the media ID associated with the selected optical disk cartridge (magnetic cassette cartridge). The printer can be integrated within the jukebox (cf col 4, line 45 et seq.). The printing of the label is triggered if a) a controller of the optical disk cartridge storage and retrieval device (jukebox) determines that a label flag is not associated with a selected one of a first number of optical disk cartridges, or b) a flag bit is set etc. (cf col 4, line 31 et seq.).
- 3.1 However, the optical disk cartridge storage and retrieval device of D2 does not have a device for reading\receiving data stored on a programmable memory device attached to or positioned on a casing of the data storage device (optical disk in D2). Hence, the subject-matter of each of the claims 1 and 7 is new with regard to D2. Moreover, even if it were possible to combine D1 and D2 (which is doubtful in view of the different types of storage devices used (magnetic tape cartridges, optical disks) as well as the very different designs), the resulting arrangement would still fail to suggest the idea of reading\receiving data stored on a programmable memory device attached to or positioned on a casing of the data storage device and printing this read\received data.

4. D3 discloses a machine for printing directly on cassette cartridges. D3 does not read\receive the data to be printed from a programmable memory device attached to or positioned on a casing of the data storage device.
5. It follows from the above paragraphs that the subject-matter of each of the independent claims 1 and 7 (as well as the dependent claims 2-6,8-9) is new and inventive and therefore the requirements of Articles 33(2)-33(4) PCT are met.

Re Item VII

Certain defects in the international application

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1-D3 is not mentioned in the description, nor are these documents identified therein.
- 1.1 Contrary to Rule 5.1(a)(iii) PCT, the description on page 8 is not in conformity with claims 7 and 8. Furthermore, the description refers to "**a second** data storage media reader" or "**a second** specific embodiment" without ever disclosing the first reader/embodiment (cf page 9, lines 10,13,27; page 18, line 19; page 19, line 4).

Re Item VIII

Certain observations on the international application

1. In order to solve the problem of improving the speed of labelling cartridges (cf page 10, lines 11-12 of the description), it is essential that the data to be **printed** is **read from the EEPROM 101** rather than for example the magnetic tape (cf page 10, lines 16-17 of the description). However, the printing step of claim 7 (cf lines 14-16 on page 22) does not reflect said feature. Although the applicant admits in his reply dated 07.03.01 (cf paragraph 1.5) that the "**feature of printing said received data signals ... is included ... in claim 7**" (where the data signals are received from the programmable memory device), the printing step of claim 7 merely prints "**a predetermined set of data items describing a predetermined stored set of parameters concerning said data storage device**". Hence, unlike claim 1, claim 7 does not include a reference to **printing aid read data**. Therefore, claim 7 does meet the clarity requirement of Article 6 PCT because it is

EXAMINATION REPORT - SEPARATE SHEET

lacking an essential feature of the invention.

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For receiving _____ use only

**REQUEST
PCT Rec'd 20 SEP 2001**

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 30980107 WO2**Box No. I TITLE OF INVENTION****INTELLIGENT MEDIA READER AND LABEL PRINTER****Box No. II APPLICANT**

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Hewlett-Packard Company

3000 Hanover Street

Palo Alto

CA 94304

US

 This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

US

State (that is, country) of residence:

US

This person is applicant all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

GOLD, Stephen

Rock Cottage

Stoke Lane Stone Lane

Winterbourne Down

BRISTOL BS36 1DJ

GB

This person is:

 applicant only applicant and inventor inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

GB

State (that is, country) of residence:

GB

This person is applicant all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

 Further applicants and/or (further) inventors are indicated on a continuation sheet.**Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

 agent common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

LAWMAN, Matthew John Mitchell

Intellectual Property Section

Hewlett-Packard Limited

Filton Road

Stoke Gifford

BRISTOL BS34 8QZ

GB

Telephone No.

+44 117 312 9947

Facsimile No.

+44 117 312 8941

Teleprinter No.

Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 30980107 WO2

Box No. I TITLE OF INVENTION

INTELLIGENT MEDIA READER AND LABEL PRINTER

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Hewlett-Packard Company

3000 Hanover Street

Palo Alto

CA 94304

US

This person is also inventor.

Telephone No.

Faximile No.

Teleprinter No.

State (that is, country) of nationality:

US

State (that is, country) of residence:

US

This person is applicant all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

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GOLD, Stephen

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BRISTOL BS36 1DJ

GB

This person is:

applicant only

applicant and inventor

inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

GB

State (that is, country) of residence:

GB

This person is applicant all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

agent common representative

Telephone No.

+44 117 312 9947

Faximile No.

+44 117 312 8941

Teleprinter No.

Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

See Notes to the request form

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

CRIGHTON, Ian Peter
1 Old Manor Cottages
Winterbourne Hill
Winterbourne
BRISTOL BS36 1JS
GB

This person is:

applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:
GB

State (that is, country) of residence:
GB

This person is applicant for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

applicant only
 applicant and inventor
 inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of: all designated States all designated States except the United States of America the United States of America only the States indicated in the Supplemental Box

Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

AP ARIPO Patent: **GH** Ghana, **GM** Gambia, **KE** Kenya, **LS** Lesotho, **MW** Malawi, **SD** Sudan, **SL** Sierra Leone, **SZ** Swaziland, **TZ** United Republic of Tanzania, **UG** Uganda, **ZW** Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT

EA Eurasian Patent: **AM** Armenia, **AZ** Azerbaijan, **BY** Belarus, **KG** Kyrgyzstan, **KZ** Kazakhstan, **MD** Republic of Moldova, **RU** Russian Federation, **TJ** Tajikistan, **TM** Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT

EP European Patent: **AT** Austria, **BE** Belgium, **CH** and **LI** Switzerland and Liechtenstein, **CY** Cyprus, **DE** Germany, **DK** Denmark, **ES** Spain, **FI** Finland, **FR** France, **GB** United Kingdom, **GR** Greece, **IE** Ireland, **IT** Italy, **LU** Luxembourg, **MC** Monaco, **NL** Netherlands, **PT** Portugal, **SE** Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT

OA OAPI Patent: **BF** Burkina Faso, **BJ** Benin, **CF** Central African Republic, **CG** Congo, **CI** Côte d'Ivoire, **CM** Cameroon, **GA** Gabon, **GN** Guinea, **GW** Guinea-Bissau, **ML** Mali, **MR** Mauritania, **NE** Niger, **SN** Senegal, **TD** Chad, **TG** Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (*if other kind of protection or treatment desired, specify on dotted line*)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

<input type="checkbox"/> AE United Arab Emirates	<input type="checkbox"/> LR Liberia
<input type="checkbox"/> AL Albania	<input type="checkbox"/> LS Lesotho
<input type="checkbox"/> AM Armenia	<input type="checkbox"/> LT Lithuania
<input type="checkbox"/> AT Austria	<input type="checkbox"/> LU Luxembourg
<input type="checkbox"/> AU Australia	<input type="checkbox"/> LV Latvia
<input type="checkbox"/> AZ Azerbaijan	<input type="checkbox"/> MA Morocco
<input type="checkbox"/> BA Bosnia and Herzegovina	<input type="checkbox"/> MD Republic of Moldova
<input type="checkbox"/> BB Barbados	<input type="checkbox"/> MG Madagascar
<input type="checkbox"/> BG Bulgaria	<input type="checkbox"/> MK The former Yugoslav Republic of Macedonia
<input type="checkbox"/> BR Brazil	<input type="checkbox"/> MN Mongolia
<input type="checkbox"/> BY Belarus	<input type="checkbox"/> MW Malawi
<input type="checkbox"/> CA Canada	<input type="checkbox"/> MX Mexico
<input type="checkbox"/> CH and LI Switzerland and Liechtenstein	<input type="checkbox"/> NO Norway
<input type="checkbox"/> CN China	<input type="checkbox"/> NZ New Zealand
<input type="checkbox"/> CR Costa Rica	<input type="checkbox"/> PL Poland
<input type="checkbox"/> CU Cuba	<input type="checkbox"/> PT Portugal
<input type="checkbox"/> CZ Czech Republic	<input type="checkbox"/> RO Romania
<input type="checkbox"/> DE Germany	<input type="checkbox"/> RU Russian Federation
<input type="checkbox"/> DK Denmark	<input type="checkbox"/> SD Sudan
<input type="checkbox"/> DM Dominica	<input type="checkbox"/> SE Sweden
<input type="checkbox"/> EE Estonia	<input type="checkbox"/> SG Singapore
<input type="checkbox"/> ES Spain	<input type="checkbox"/> SI Slovenia
<input type="checkbox"/> FI Finland	<input type="checkbox"/> SK Slovakia
<input checked="" type="checkbox"/> GB United Kingdom	<input type="checkbox"/> SL Sierra Leone
<input type="checkbox"/> GD Grenada	<input type="checkbox"/> TJ Tajikistan
<input type="checkbox"/> GE Georgia	<input type="checkbox"/> TM Turkmenistan
<input type="checkbox"/> GH Ghana	<input type="checkbox"/> TR Turkey
<input type="checkbox"/> GM Gambia	<input type="checkbox"/> TT Trinidad and Tobago
<input type="checkbox"/> HR Croatia	<input type="checkbox"/> TZ United Republic of Tanzania
<input type="checkbox"/> HU Hungary	<input type="checkbox"/> UA Ukraine
<input type="checkbox"/> ID Indonesia	<input type="checkbox"/> UG Uganda
<input type="checkbox"/> IL Israel	<input checked="" type="checkbox"/> US United States of America
<input type="checkbox"/> IN India	<input type="checkbox"/> UZ Uzbekistan
<input type="checkbox"/> IS Iceland	<input type="checkbox"/> VN Viet Nam
<input checked="" type="checkbox"/> JP Japan	<input type="checkbox"/> YU Yugoslavia
<input type="checkbox"/> KE Kenya	<input type="checkbox"/> ZA South Africa
<input type="checkbox"/> KG Kyrgyzstan	<input type="checkbox"/> ZW Zimbabwe
<input type="checkbox"/> KP Democratic People's Republic of Korea	
<input type="checkbox"/> KR Republic of Korea	
<input type="checkbox"/> KZ Kazakhstan	
<input type="checkbox"/> LC Saint Lucia	
<input type="checkbox"/> LK Sri Lanka	

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

.....

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (*Confirmation (including fees) must reach the receiving Office within the 15-month time limit.*)

Box No. VI PRIORITY CLAIM Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) 24 March 1999 (24/3/99)	99302266.4	EP		
item (2)				
item (3)				

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (*only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office*) identified above as item(s): _____

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA /

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year) Number Country (or regional Office)
05/10/99 99302266.4 EP

Box No. VIII CHECK LIST: LANGUAGE OF FILING

This international application contains the following number of sheets:

request	: 4
description (excluding sequence listing part)	: 19
claims	: 3
abstract	: 1
drawings	: 8
sequence listing part of description	: _____
Total number of sheets	: 35

This international application is accompanied by the item(s) marked below:

1. fee calculation sheet
2. separate signed power of attorney
3. copy of general power of attorney, reference number, if any
4. statement explaining lack of signature
5. priority document(s) identified in Box No. VI as item(s):
6. translation of international application into (language): _____
7. separate indications concerning deposited microorganism or other biological material
8. nucleotide and/or amino acid sequence listing in computer readable form
9. other (specify): Search Report

Figure of the drawings which should accompany the abstract: 2

Language of filing of the international application: English

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Matthew John Mitchell Lawman

For receiving Office use only

1. Date of actual receipt of the purported international application:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA /
6. Transmittal of search copy delayed until search fee is paid.

2. Drawings: received: not received:**For International Bureau use only**

Date of receipt of the record copy
by the International Bureau:

PRAIRIE
20 APR 2000
REGULUS

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:
HEWLETT-PACKARD Limited
Intellectual Property Section
Attn. Lawman, Matthew John M.
Filton Road
Stoke Gifford
Bristol BS34 8QZ
UNITED KINGDOM

**NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION**

(PCT Rule 44.1)

Date of mailing
(day/month/year) **18/04/2000**

Applicant's or agent's file reference

30980107 W02

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.

PCT/GB 00/00679

International filing date
(day/month/year)

25/02/2000

Applicant

HEWLETT-PACKARD COMPANY et al.

1. The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Further action(s): The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority

European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 po nl,
Fax: (+31-70) 340-3016

Authorized Officer
Marja Brouwers

NOTE TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the International application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/s is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the International application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the International application is English, the letter must be in English; if the language of the International application is French, the letter must be in French.

NOTES TO FORM PCT/ISA/220 (Continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

PATENT COOPERATION TREATY
PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 30980107 W02	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/00679	International filing date (day/month/year) 25/02/2000	(Earliest) Priority Date (day/month/year) 24/03/1999
Applicant HEWLETT-PACKARD COMPANY et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :
 - contained in the international application in written form.
 - filed together with the international application in computer readable form.
 - furnished subsequently to this Authority in written form.
 - furnished subsequently to this Authority in computer readable form.
 - the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
 - the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. Certain claims were found unsearchable (See Box I).

3. Unity of Invention is lacking (see Box II).

4. With regard to the title,

- the text is approved as submitted by the applicant.
- the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- the text is approved as submitted by the applicant.
- the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

- as suggested by the applicant.
- because the applicant failed to suggest a figure.
- because this figure better characterizes the invention.

2

None of the figures.

Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

The abstract is changed as follows:

line 1: after 'device' insert '(200)';
line 10: after 'library' insert '(201)';
line 10: after 'arm' insert '(202)'.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00679

A. CLASSIFICATION F SUBJECT MATTER
IPC 7 G06K17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06K

Documentation searched other than minimum documentation to the extent that such documents are included. In the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 455 409 A (BOWER JR ROBERT ET AL) 3 October 1995 (1995-10-03) column 1, line 53-65; claims 1,17; figures 1,4,8A-8D,14,15 column 5, line 56 -column 6, line 9 column 8, line 13 -column 10, line 2 column 10, line 55 -column 11, line 19 column 20, line 21 -column 22, line 60 column 26, line 10-32	1-9
Y	US 5 592 596 A (BALSMON JAMES) 7 January 1997 (1997-01-07) column 1, line 18-28 column 2, line 14-37 column 4, line 32 -column 5, line 17 column 7, line 32-59; claims 3,4,6	1-9



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the International filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the International filing date but later than the priority date claimed

"T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the International search

11 April 2000

Date of mailing of the International search report

18/04/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5018 Patentiaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Cardigos dos Reis, F

INTERNATIONAL SEARCH REPORT

International Application No

GB 00/00679

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 121 687 A (ARCOTTA JOHN) 16 June 1992 (1992-06-16) the whole document _____	2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/00679

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5455409	A 03-10-1995	CA 2224168 A WO 9700496 A	03-01-1997 03-01-1997
US 5592596	A 07-01-1997	NONE	
US 5121687	A 16-06-1992	NONE	

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REINACED BY
ATT 34 AMDT

INTELLIGENT MEDIA READER AND LABEL PRINTER

Field of the Invention

The present invention relates to recording medium cartridges of the type which include a memory device for storing information concerning the cartridge and data recorded on the recorded medium, and particularly although not exclusively it relates to the manner of reading this information and using it to produce a printed label containing all of, or a selected subset of this information.

Background to the Invention

In order to store digital electronic data, such as back-up data from a server computer device, it is known to use magnetic tape data storage cartridges comprising one or a pair of rotatable reels, and an elongate band of magnetic tape. A main reason for using such tape data storage cartridges is to make back up copies of important data. Customers running large computer installations, or research and development facilities having significant amounts of data generated may have hundreds or thousands of tape data storage cartridges containing back up data, backed up from a wide range of different host devices such as servers and computer devices. Large collections of tape data storage cartridges tend to be stored in centralised library locations, sometimes situated in fire proof safes or fire proof rooms. The library storage facility may be geographically remote from the host server devices, so that if there is destruction of data on the host devices, for example by a fire, the back up data remains safe. When a host device fails and data is lost, it is necessary to quickly locate the tape cartridge having the latest back up data, which may be located in an offsite library.

These libraries include manual access libraries, where the cartridges are simply stored on shelves or in racks or boxes, with access to the cartridges being by manually picking up the cartridges, or automated libraries, where the

cartridges are stored in predefined locations on a rack or shelf and are automatically accessed. In a manual access library, to identify a content of a tape cartridge a person may simply write out a label manually, describing the content of the data on the tape cartridge. This process is tedious and prone to
5 error. For example the wrong label might be put on the wrong tape, so that the contents of the label do not coincide with the data of the tape cartridge. Alternatively, tape cartridges have barcodes printed on their external cases, so conventionally finding a particular tape may involve using a barcode scanner to scan a plurality of barcode labels on a plurality of tape cartridges. In the case of
10 an automated library, robotic arms which are software controlled, deposit and collect cartridges in a rack, or shelf, and use a serial number of a tape data storage cartridge to determine a location within the library shelf or rack on which to store the cartridge. The rack or shelf is accessible by the robotic arm which may physically select a required tape on receipt of user instructions, the robotic
15 arm being moved under computer control to a cartridge storage location on the rack or shelf.

Conventionally, a person wishing to find an item of stored data on a cartridge will need firstly to identify the correct cartridge with the data on it, and
20 secondly identify a position of the data on the tape stored within the cartridge. In the case of single reel cartridges, the whole of the magnetic tape is wound on to the single cartridge whenever the cartridge is not in a tape drive mechanism. To find a particular item of data on a cartridge, a person must select the cartridge, put the cartridge into a conventional tape drive device, for example forming part
25 of a host personal computer, workstation, or computerised test equipment device, and view a content of the tape on a visual display unit forming part of the host computer, workstation or test equipment device. There is a time lag incurred in winding and rewinding the tape to identify a particular item of data.

A current industry trend in tape data storage media is to supply a solid state transponder memory data storage device on or within a tape cartridge, on which can be stored information describing a data content of the tape. Examples of the type of information stored include file name and type, customer information, 5 system data backed-up, application and file space on the magnetic tape used or remaining. The information stored on such a memory device is upgraded when the magnetic tape is accessed using a known tape drive in a host computer having an integrated driver and read-write device, controlled by software resident on the host device. Many different types of tape data storage cartridge are used 10 in system backup and the location of the transponder memory storage device in relation to a casing of the tape cartridge varies between cartridge media types and is specific to the particular cartridge media type in each case.

To identify items of data stored on the tape cartridge, the memory device 15 comprising part of the cartridge stores data as mentioned above, describing the file names, customer information, application and file space remaining on the tape or used on the tape, and dates of storage of files. A summary information describing the data items stored on the tape can be obtained by automatically interrogating the transponder memory storage device in the cartridge, which is 20 read by the tape drive device by inductive coupling to a transceiver chip forming part of the memory device, and which can be displayed on the visual display unit of the host device. Reading the content of the memory device involves physically picking up the data cartridge, putting the data cartridge in the tape drive of the host device, operating a keypad or pointing device, for example a mouse or 25 tracker ball, to select menu items from an application program on the host device, in order to identify the information describing the data content of the tape.

In order to print a label for the tape, this involves running an application 30 stored on the host device, perhaps manually entering the information describing the data on the tape via a keyboard and/or pointing device and then printing out

the label. A problem in printing a label for the tape cartridge by this mechanism is the time taken to print each label. For example, for a person wishing to find a particular item of data in a library, the first time a person enters the library on a particular day, he may have to pick an unlabeled tape cartridge which the person

5 thinks the data item may reside on, and in order to check the data on the cartridge needs to turn on the host computer device, wait for the host device to boot up and initialise, taking possibly a minute or two, select the application required for reading the memory device on the cartridge, again perhaps taking of the order of one or two minutes, and then read the data. If the data cartridge

10 does not contain the required data, then the person needs to remove the cartridge from the drive, which may or may not involve a delay in the software controlling the tape drive unit allowing the person to remove the tape, and then select a different tape from the shelf. For the second, subsequent tape cartridge inspected, the time delays will be shorter than inspecting the first data cartridge,

15 since the host device does not need to be booted up and initialised. However, there is still a significant delay in interrogating the memory device on the cartridge through the application software provided by the host device.

Having found the data cartridge containing the required data, in order to

20 print a label for attachment to the cartridge, the person needs to call up the application software for printing the label, perhaps enter details describing the cartridge manually into the printing application software, using a keyboard and/or pointing device and before printing make sure that an attached printer device is turned on. In order to turn the printing device on, the printing device may go

25 through a print initialisation routine, which in the case of an inkjet printer may take several minutes if used for the first time on a particular day, and providing there is sufficient print medium in the printer device, then a label can be printed. However, since many printer devices use paper as a print medium, it may be necessary to find and insert sheets of adhesive labels into the printer in order to

30 print out an adhesive label for the tape cartridge.

Therefore, conventionally it may take anything of the order of 10 to 15 minutes to print a label for a data cartridge, including all the time delays involved in booting up a host device and initialising a printer. Additionally, this assumes

5 that a host computer device is available at the location of the library, which it may not be, in which case an additional delay is incurred in taking the tapes to the host device for the data to be reloaded. Although the time delay taken to print a label for subsequent tape cartridges after the first will reduce per cartridge, the cataloguing and identification of data stored on existing legacy libraries of tape

10 data storage cartridges is a time consuming process, whether the library is a manual access library, or an automated library having a robotic device for selected cartridges.

In all cases, in order to improve ease and accuracy of access to the

15 required data, a system for checking the data stored on a tape and labeling the tape accurately will be of benefit.

Summary of the Invention

Specific embodiments and methods according to the present invention aim

20 to improve the speed and accuracy of access of data contained on a plurality of data storage cartridges in a library of such cartridges.

The specific embodiments and methods disclosed herein aim to provide improved protection against loss of data by providing a rapid and accurate means

25 of locating backed-up data required to restore lost data to a system.

Specific methods according to the present invention, recognise that information contained on transponder memory devices in a data storage cartridge can be used to provide a rapid means of access to a data set which can be

30 utilised to identify the cartridge and to produce a cartridge label.

Conceptually, the specific embodiments of the invention aim to provide an integrated printer with built-in radio frequency capability to read information stored on a memory device integrated into a data storage medium cartridge casing which automatically prints the information read from the memory device in a pre-formatted user-readable form on a label suited to the specific cartridge casing type.

According to first aspect of the present invention there is provided an automatic library device for storing a plurality of cartridge type data storage devices each having a casing containing a high capacity data storage medium, and having a programmable memory device attached to said casing, said programmable memory device storing data describing said data storage device, said library device comprising:

a rack storage means having a plurality of receptacles for storing said plurality of said data storage devices;

an automatic selection means operable to select, retrieve and replace said data storage devices from said rack; and

a reader device capable of reading a data content stored on a said programmable data storage device, wherein said selection means is configured to present a said data storage medium to said reader device, said reader device being configured to read data signals from said data storage device and print said data onto a print media.

Preferably said reader device comprises a port configured to accept said cartridge type data storage device, and a printer device located in said port, said printer configured to print directly to a said data storage device when said data storage device is inserted in said port.

Said reader device may comprise:

a receiver means capable of receiving data signals from a said
5 programmable memory of a said data storage device; and

an interface means, arranged for interfacing with said processor for
communicating said data signals to an external processor device.

10 Said reader device may comprise:

an interface means, arranged for interfacing with said processor for
communicating said data signals to an external processor device, such that
inspection of information contained in data read from said programmable memory
15 device of said data storage device can be accessed on said external processor
device via said interface.

The library device may further comprise:

20 a read only memory means storing an operating system or operating said
processor to display said data items received from said received means; and

a display device arranged to display said data items read from said
programmable memory device.

25

The library device may comprise a means for emitting a power signal to said
data storage device, said power signal emitting means located in close proximity
to said cartridge port, for supply of power to said programmable memory device.

According to a second aspect of the present invention there is provided a method of labeling a data storage device with information stored on a programmable memory device positioned externally on a casing of said data storage device, said method comprising the steps of:

5

placing said data storage device in a port of a reader device capable of reading data signals describing a data content stored on said programmable memory of said data storage device;

10

polling a detector device located in said port of said reader device for detecting said signals;

receiving said data signals describing a predetermined stored set of parameters concerning said data storage device;

15

storing said data signals in a memory device of said reader device; and

printing said predetermined set of data items on an area having a size and shape which fits on said data storage device.

20

Said step of printing said predetermined set of data items may comprise printing said predetermined set of data items on a label of a size and shape suitable for direct attachment to said data storage device.

25

Said step of printing may comprise printing said data items directly onto a cartridge of said data storage device.

30

Brief Description of the Drawings

For a better understanding of the invention and to show how the same may be carried into effect, there will now be described by way of example only, specific embodiments, methods and processes according to the present invention with reference to the accompanying drawings in which:

5

Fig. 1 illustrates schematically a tape data storage cartridge having an embedded read/write memory accessible by means of a transponder unit within the cartridge, as is known in the prior art;

10

Fig. 2 illustrates schematically an installation of a second data storage media reader and labeling device in an automated data storage medium library having a rack and shelf arrangement accessible by a computer controlled robotic arm, according to a second specific embodiment of the present invention;

15

Fig. 3 illustrates schematically in greater detail, the reader-labeling device;

Fig. 4 illustrates schematically a control process operated in the reader labeling device by means of a set of command sequences;

20

Figs. 5A to 5G illustrates schematically displays of predetermined selected data items read from the data storage cartridge, and which appear on the display screen of the first reader-printer device;

25

Fig. 6 illustrates schematically an example of a layout of a label printed by the reader-printer device; and

Fig. 7 illustrates the second reader-labeling device used in stand alone context in a purpose designed casing having a power supply.

30

Detailed Description of the Best Mode for Carrying Out the Invention

There will now be described by way of example the best mode contemplated by the inventors for carrying out the invention. In the following description numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent however, to one skilled in the art, that the present invention may be practised without limitation to these specific details. In other instances, well known methods and structures have not been described in detail so as not to unnecessarily obscure the present invention.

10 In order to remove errors in cartridge labeling and to improve the speed of labeling, a media-dependent labeling system is envisaged which is specific to a particular type or design of data storage media device. This uses information contained on a memory device located in the data storage cartridge (the media) to produce a printed cartridge label, where the label attributes can be selected by
15 the user. This system enables cartridge data to be assessed and the cartridge to be labelled without having to access the data stored on the magnetic tape and hence avoiding the use of a tape driver of a host device. As a result, the information concerning data contained in the cartridge can be assessed rapidly. By integrating a means of reading the information contained on the cartridge
20 memory device with a means of printing this information either directly to a pre-labelled cartridge or to a blank label all within one device, cartridge labels may be updated accurately and rapidly.

Labeling of a data storage device need not occur at a time when data is
25 recorded on the data storage medium, but labeling can occur retrospectively, and away from a host device having a tape drive mechanism.

Additionally, the device may support multiple language sets and fonts for
versatility in user readout. This will allow for versatility and accuracy in user
30 access to cartridge data.

Specific methods according to the present invention described herein are concerned with the reading of data from solid state memory devices located on data storage devices and writing this data to a memory area and the selection of
5 data from this memory area for display and printing.

In one embodiment, a media reader and printer device may be incorporated into a standard 5.25 inch device slot.

10 Referring to Fig. 1 herein, there is illustrated schematically a conventional prior art tape data storage cartridge device comprising a cartridge casing 100, containing one or a pair of reels on which is wound an elongate band of magnetic tape, comprising a high capacity data storage medium on which data may be recorded from a host device such as a computer server device, a personal
15 computer, a workstation, or a computer controlled test instrument. The cartridge contains a solid state programmable memory device 101 within the cartridge casing 100, the memory device comprising a transponder unit, and a read/write memory, which can be written to or read via the transponder unit, which can be inductively powered by an RF signal generated by a transmitter placed
20 immediately adjacent the cartridge casing, as is known in the art. The height, width, and length dimensions of the cartridge casing 100 and the general layout of the casing, including the positioning of the memory device 101 within the casing, are specific to the particular type and design of tape data storage cartridge. That is to say the layout of the cartridge is media specific.

25

Information about the cartridge and the data stored on the cartridge can be stored in the memory device 101. The data stored may include data describing file names of data on the tape, data describing customer information, data describing an application stored on the tape, data describing an amount of

unused memory space remaining on the tape, and dates upon which files were stored.

Referring to Fig. 2 herein there is illustrated schematically a specific embodiment cartridge reader and labeling device 200 installed in situ in an automated data storage cartridge library comprising a shelf or rack 201, having a plurality of locations for storing a plurality of tape data storage cartridges; a automatic robotic arm 202 operable to select and access individual tape data storage cartridges, the robotic arm 202 travelling along a substantially linear track 203, the arm capable of moving in vertical and first and second lateral directions and being capable of removing tape cartridges from their location, physically transporting them to reader and labeling device 200, inserting and extracting the cartridges from the reader and labeling device 200 and returning them to their storage locations. The second reader and labeling device interfaces with an external computer 204 having a processor, and/or an external printer 205.

Referring to Fig. 3 herein, there is illustrated schematically in greater detail the reader-labeling device 200. The reader-labeling device comprises a casing 300 suitable for fitting into, a 5.25 inch standard computer casing port, having power supply terminals and interface terminals at a rear of the casing (interface terminal not shown), the interface terminal comprising a standard computer peripheral port, on a front face of the casing 300 there being provided a cartridge port 301 for accepting a tape data storage cartridge, in a manner such that the tape data storage cartridge when inserted into the port may have a remaining portion projecting and extending out of the port, allowing the robotic arm to grasp the cartridge for insertion and removal from the port; optionally, a display device 302, and a keypad entry device 303; a processor; a programmable memory area; a control interface; a read only memory (ROM) containing an operating system; and an interface for interfacing with external computer 204 and external printer 205. When installed in rack 201, the second reader-labeling device may be

controlled and accessed externally from the external processor of computer 204 via the interface. The interface provides an external means of user input when the reader device is incorporated in a 5.25 inch device slot thus forming an integrated part of a larger system. This form of user input precludes the use of

5 the optional casing mounted keypad 303 for inputting commands or the casing mounted display screen 302 for outputting status. The optionally provided display device 302 and keypad entry device 303 may be used for manual operation of the second reader device, for inspection of a tape cartridge as an override to automatic reading and inspection of the tape cartridge information.

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The processor has a relatively small amount of separate memory of the order of 1 MByte or less, and is limited practically by the smallest size of memory chip commercially available. Alternatively, the processor may be constructed integrally with memory area on a same chip, for example a known Power PC® chip. In the best mode, to achieve compact size and ease of manufacture, the components are as integrated as possible with the processor, and preferably include a built-in operating system in read only memory ROM, on a same chip as the processor.

20

An aerial and receiver are used to receive data from the memory device 300 of the cartridge, which uses an electrically erasable programmable read only memory (EEPROM) as read/write memory area. With the data storage cartridge inserted in the reader device, the aerial, of the memory device, forms a contact less interface with the aerial of the reader device using an inductive coupling scheme using a magnetic field to transmit data to the receiver 304. In the best mode, the protocol used to transmit information by the inductive coupling scheme is known as the MIFARE ® system developed by Phillips/Mikron of the type presently employed in "Smart" credit card technology for use in personal banking applications and which is known in the art. Advantages and features of this 25 system as used by the first embodiment include a high reliability, an operating

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frequency 13.56 MHz, and an anti-collision protocol, which provides an ability to handle several transponders in close proximity without interference.

The aerial of the reader and labeling device is positioned such that when a
5 tape cartridge having an aerial is positioned in the cartridge receiving means of the reader device, the two aerials are positioned a distance less than or equal to 20 mm from each other, so that inductive coupling can occur between the two aerials. Over such a range this yields coupling factors between aerials of the order 1 to 10% and transmission speeds of the order 100 Kbps between the
10 aerials. The receiver of the reader and labeling device transmits an inductive signal which is received by the transponder of the tape cartridge, and which powers the transponder memory storage device in the tape cartridge, such that the transponder is able to emit signals describing the content of the memory storage area across an air gap between the two aerials, which is received by
15 receiver. Alternatively, transmission of data signals between the memory device and the reader-labeling device may be within the infra-red range of frequencies.

Data read from the memory device 300 in this manner is written via the processor 305 to programmable random access memory, (RAM), where a copy
20 of all read data is maintained. Data stored in the RAM is displayed on the display screen 302 or is accessed via the external processor using the control interface.

Writeable, erasable and re-writeable labels may be directly provided on the tape data storage cartridges as supplied. Within casing 300, there is provided an
25 internal printing device, which is configured for printing directly onto a label on a tape data storage cartridge, when the tape data storage cartridge is located within the port 301.

Referring to Fig. 4 herein, a first mode of operation of the reader- labeling
30 device within the context of the automatic library system will now be described.

In use, the reader device may be inaccessible to a user. The robotic arm 202 may be controlled by it's own dedicated control systems to select and access a tape cartridge from a rack, as is conventionally known in the prior art. However, in the first mode of operation, the act of the robotic arm 202 placing a tape data

5 storage cartridge into the cartridge slot of cartridge reader 200 activates a sensor internal to the cartridge receiving slot of the card reader which generates a signal to initiate a series of steps for printing label information directly to a writeable label portion of the tape data storage cartridge. The processor operates a series of control steps 400 to 406. A first mode of operation will now be described. The

10 robot arm places a tape data cartridge into the receiving port 301 of the reader and labeling device, thereby locating the cartridge firmly in the device in a position where the transponder memory device of the cartridge lies in close physical proximity to the aerial and receiver of the reader and labeling device. The processor under control of operating system stored in the ROM operates in

15 an initial state 400, from which the cartridge port is periodically polled in step 401. All transponders within the operating range return a 10 byte alpha-numeric serial number. If no memory device is detected in the port in step 402, the cartridge port is presumed empty, and the processor idles through the initial state, and continues to poll the cartridge port in step 401. The cartridge slot is presumed

20 empty if no serial number is returned. Consequently an external detector device incorporated in the cartridge port of the reader device may be polled in step 403 to check whether a cartridge is inserted into the port. If no cartridge is detected, the processor returns to initial state 400, continuously polling the cartridge slot in step 401 and/or polling the detector in step 403. If a memory device is detected

25 in steps 403 or 401, the processor enters a memory device detected state 404 from which the processor reads data received by the receiver via the aerial. The receiver continuously transmits a power signal to the transponder in the tape cartridge in order to allow the transponder to transmit signals through the aerial containing data concerning the information stored on the read/write memory

30 device. Transmission of the power signal across the air gap by the aerial may be

dependent upon the sensor within the reader and labeling device casing being activated by insertion of a tape data storage cartridge.

In step 406, data read from the memory device through the receiver is
5 directed by the processor into the random access memory. Data can be selected
from the random access memory in step 407 for display on the display device in
step 409. Display of data from the RAM is accessed through operation of a
menu system in step 410. Initially, predetermined data, for example a serial
number of the cartridge which has been read from the memory device may be
10 displayed on the display device.

Referring to Figs. 5 herein, there are shown displays which may occur on
the display 302 of the reader labeling device in the first mode of operation.
Referring to Fig. 5A herein, there is illustrated schematically an example of
15 information displayed on a display device, the information comprising a serial
number of a tape cartridge. Upper and lower scroll icons 500, 501 may appear
on the display, giving a visual indication to the operator that to access further
items of data, the upper and lower scroll buttons of the keypad need to be
activated. In step 410 a user may enter keypad entries, for example pressing a
20 scroll button which scrolls through display items as illustrated in Figs. 5B to 5G
herein under control of the operating system stored in the ROM of the reader
labeling device, in the menu system. The operating system stored in the ROM is
specifically configured from a knowledge of the format and layout of the
information items stored as data in the memory device of the cartridge. By
25 scrolling through the menu, by operating the keypad scroll buttons, display of the
serial number of the tape, the date the tape was last used, an amount of memory
remaining on the tape, names of back up sessions stored on the tape e.g. "Full
Backup Monday 3/8/98", a number of times the tape has been used, a number of
errors on the tape and an option to print a label containing a predetermined set of
30 information items describing data stored on the tape may be accessed. If, in

response to a 'print label' display as illustrated in Fig 5G, a key on the keypad is pressed, then in step 409, the processor sends a signal to the printer, along with signals describing the information to be printed on the label, which activates the printer to print a label. The label characteristics may be determined by user input

5 via the menu system 409. Characteristics include a chosen language set, font size and type, and in this way allow the user to customise the label as necessary.

In step 407, data is selected from random access memory, and is directly printed to a writeable medium on the tape data cartridge in step 408. Printing is direct to the cartridge and printing may be activated by a sensor triggered on insertion of

10 the tape cartridge to the cartridge port.

In a second, automated mode of operation, an external computer device 204 comprising external processor, external display, external keypad and data entry device, e.g. a pointing device or mouse, and an external printer 205 may be

15 used to access the information stored on the memory device, externally of the automatic library. For example a PC, laptop or palmtop device connected to a printer device 205 may be used. In step 412, a user enters details on an external keypad, whilst viewing menu items displayed on the external display in step 413, which are transmitted from the reader-labeling device menu system via the

20 interface through a series of control interface steps 414. By activating keys on the external keypad, the user may activate an external print operation 415 of external printer 205 to print a label for the cartridge. Alternatively, printing need not be activated, but a user may automatically view information contained on the tape cartridges via the external computer device, e.g. palmtop or laptop

25 computer, which displays menu items on its screen.

Operation in the third mode is substantially similar as described herein above to the second mode, except when printing a label in step 415, the printer device within the casing 300 is activated externally via the interface in step 414,

30 by viewing an external display 413 and activating keys in step 412 from an

external keypad, such that the data to be printed on the label may be viewed externally by a user on the external computer device, and printing, once activated by a user externally of the reader device 200, takes place internally of the reader device 200 and directly onto the cartridge within the port 401.

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An example of a printed label is illustrated in Fig. 6 herein. The predetermined set of information items may be selected from the set: a serial number of the tape; a date the tape was last used; an amount of memory space remaining on the tape; a file name of a first file on the tape; a file name of the last 10 file on the tape, a name of a back up session stored on the tape. This list of predetermined selected information items is exemplary, and not exhaustive, and the exact information items which are printed on the label depend upon the exact information items which are stored on the memory on the cartridge tape, which are specific to the particular media format of the tape cartridge and reader- 15 labeling device, as will be understood by those skilled in the art.

Referring to Fig. 7, in a variation of the second specific embodiment, the second reader-labeling device may be adapted, such that it can be removed from a standard 5.25 inch port contained within the automatic library, and a custom 20 made casing 700, e.g. a plastics moulding having an in-built power supply may be provided such that the second reader-labeling device can be removed from the automated library, inserted into the casing 700, from which it obtains power, and be used as a stand alone reader-labeling device for printing labels from data storage cartridges which are manually inserted into port 301.

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The power supply in-built to the casing may comprise a bay for containing a plurality of conventional dry cell batteries, giving for example a 12v power supply, enabling stand alone operation. Alternatively, the power supply may comprise a rechargeable battery in-built into the casing. In a further option, the power supply 30 may comprise a transformer and voltage reducer built into the casing and

connectable to an external mains supply by a conventional mains supply lead and connector. A conventional connector at the rear of the second embodiment reader-labeling device may connect with the power supply within the casing, on inserting the second reader-labeling device into the casing in a sliding location

5 operation.

Operation in stand alone mode is by user simply inserting a data storage cartridge directly into the second reader-labeling device, which automatically reads data on the transponder device, and prints a pre-determined set of data

10 onto a print media directly attached to the data storage cartridge. The print media may comprise a pre-manufactured area comprising part of a plastics cartridge case, suitable for direct printing thereon, or alternatively a user may manually stick an adhesive paper label onto the printer cartridge prior to inserting into the second reader-labeling device, the printer printing directly to the label

15 attached to the data cartridge.

Claims:

1. An automatic library device for storing a plurality of cartridge-type data storage devices, each having a casing containing a high capacity data storage medium, and having a programmable memory device attached to said casing, said programmable memory device storing data describing said data storage device, said library device comprising:

a rack storage means having a plurality of receptacles for storing said plurality of said data storage devices;

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an automatic selection means operable to select, retrieve and replace said data storage devices from said rack; and

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a reader device capable of reading a data content stored on a said programmable data storage device, wherein said selection means is configured to present a said data storage medium to said reader device, said reader device being configured to read data signals from said data storage device and print said data onto a print media.

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2. The library device as claimed in claim 1, wherein said reader device comprises a port configured to accept said cartridge type data storage device, and a printer device located in said port, said printer configured to print directly to a said data storage device when said data storage device is inserted in said port.

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3. The library device as claimed in claim 1, wherein said reader device comprises:

a receiver means capable of receiving data signals from a said programmable memory of a said data storage device; and

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an interface means, arranged for interfacing with said processor for communicating said data signals to an external processor device.

4. The library device as claimed in claim 1, wherein said reader device
5 comprises:

an interface means, arranged for interfacing with said processor for communicating said data signals to an external processor device, such that inspection of information contained in data read from said programmable memory
10 device of said data storage device can be accessed on said external processor device via said interface.

5. The library device as claimed in claim 1, further comprising:
15 a read only memory means storing an operating system or operating said processor to display said data items received from said received means; and

a display device arranged to display said data items read from said programmable memory device.
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6. The library device as claimed in claim 1, further comprising means for emitting a power signal to said data storage device, said power signal emitting means located in close proximity to said cartridge port, for supply of power to said programmable memory device.

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7. A method of labeling a data storage device with information stored on a programmable memory device positioned externally on a casing of said data storage device, said method comprising the steps of:

placing said data storage device in a port of a reader device capable of reading data signals describing a data content stored on said programmable memory of said data storage device;

5 polling a detector device located in said port of said reader device for detecting said signals;

receiving said data signals describing a predetermined stored set of parameters concerning said data storage device;

10

storing said data signals in a memory device of said reader device; and

printing said predetermined set of data items on an area having a size and shape which fits on said data storage device.

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8. The method as claimed in claim 7, wherein said step of printing said predetermined set of data items on a label of a size and shape suitable for direct attachment to said data storage device.

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9. The method as claimed in claim 7, wherein said step of printing comprises printing said data items directly onto a cartridge of said data storage device.

25

Abstract

INTELLIGENT MEDIA READER AND LABEL PRINTER

A library system having a reader and labeling device for interrogating data storage cartridges of the type containing an in-built memory chip having information stored describing details of data contained on the data storage medium is disclosed. The reader-labeling device comprises a processor, random access memory, printer, display, keypad, operating system, transponder, receiver and battery power supply. Key parameters describing a data cartridge can be accessed quickly and efficiently without the need to access the data storage medium itself. A cartridge media specific label may be rapidly printed for attachment to a data storage cartridge. The reader-labeling device may be incorporated into an automatic library accessible by a robotic arm, wherein the user may quickly read summary information describing a data storage cartridge or its contents from information stored on a memory attached to the cartridge by use of the reader-labeling device externally controlled.

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